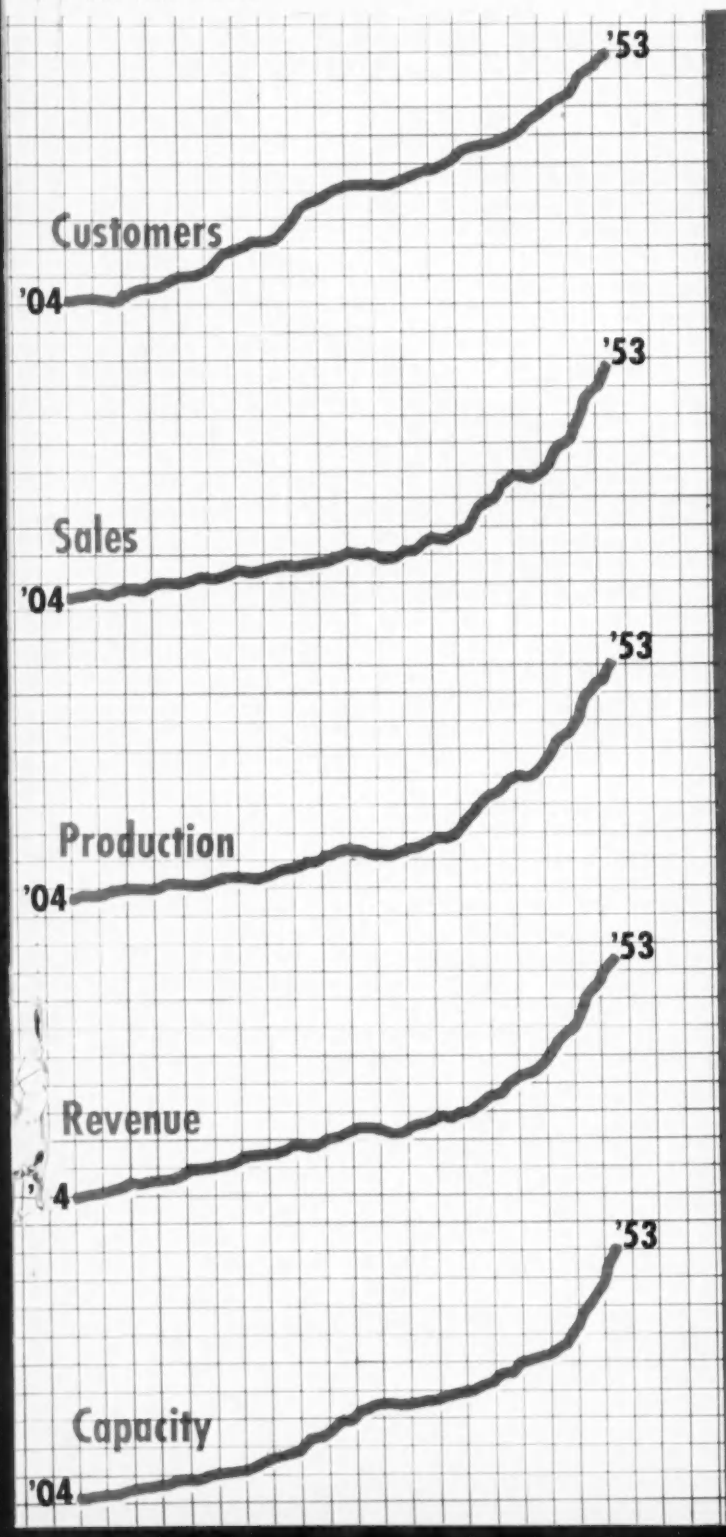
JANUARY 25, 1954

Electrical World

Price One Dollar

A McGRAW HILL PUBLICATION

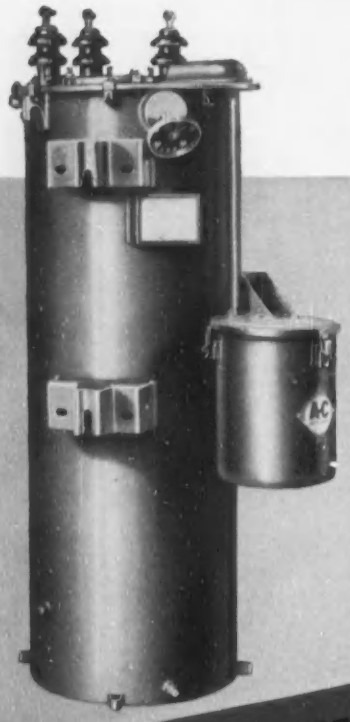


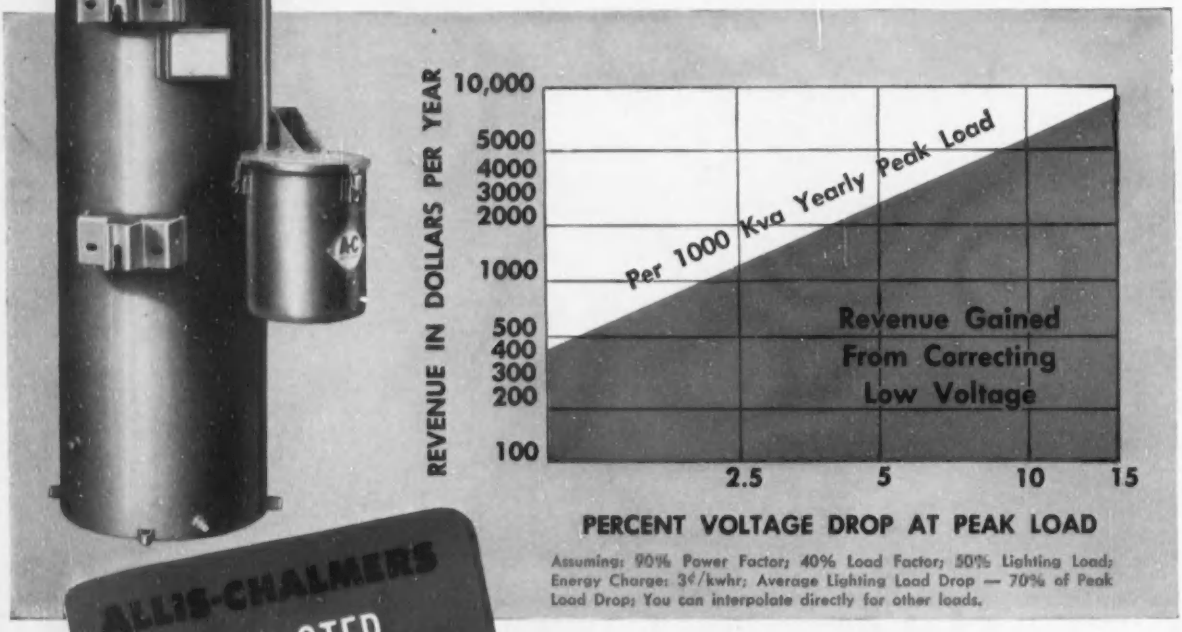
Symbolizing...

Electrical World's 50th Statistical Issue

HOW SMALL INVESTMENT

. . . Increases Revenue





ALLIS-CHALMERS 5/8% STEP VOLTAGE REGULATORS

The chart above shows it pays in increased revenue to get accurate voltage by using Allis-Chalmers distribution regulators. Initial cost is low. And operating costs are low too because you get reliable regulation with an absolute minimum of maintenance.

Get Years of Satisfactory Operation

...the *Quick-Break* mechanism has been field tested for twenty years in thousands of applications — it can withstand five million operations.

. . . long-life contacts are made of arc-resisting material in generous dimensions . . . will last for 40 years normal operation.

. . . unit construction makes top-quality workmanship possible because all connections can be made and inspected before tanking.

. . . installation and maintenance are easy — careful engineering eliminates necessity for highly trained operators.

Get More Facts

Your nearby Allis-Chalmers district office can supply you with complete information on distribution regulators. Call them or write Allis-Chalmers, Milwaukee 1, Wis.

A-4184

ALLIS-CHALMERS

Golden Anniversary

This is the 50th anniversary of the Statistical Issue of Electrical World—a celebration which occurs concurrently with the industry's Diamond Jubilee.

For the past half-century, Electrical World has compiled statistics and data for the industry. This year is no exception.

Blanket Coverage . . . The 1954 statistical "workshop" got started on the issue last October when questionnaires were sent to utilities throughout the nation, U. S. territories and possessions, and Canada. Replies, representing almost blanket coverage, give a picture for 1953 by bringing information up to Nov. 1 with estimates for the last two months, and 1954.

The facts this year, however, are given a new treatment. Detailed data —both survey and historical—are presented in nine geographical regional breakdowns with historical figures ranging from 1937 to 1953. Outstanding coverage highlights industry construction, which soared to new heights.

EW's Sales and Service Department, although not a part of the statistical section, offers an excellent picture of the appliance industry during 1953.

Industry Cooperation . . . Excellence of the issue is made possible by the cooperation of the Federal Power Commission, Rural Electrification Administration, Bureau of Labor Statistics, National Electrical Manufacturers Association, Canada's Dominion Bureau of Statistics, Irving Trust Co, Reis & Chandler, Inc, and nine other U. S. federal agencies. Edison Electric Institute contributed a major share to the success of the issue.

Electrical World

Published for 79 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 141 No. 4 — January 25, 1954

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ANOTHER INDUSTRIAL CUTS POWER DISTRIBUTION COSTS WITH OKOLITE-OKOPRENE

●

The Ohio Oil Company used existing structures in low cost installation of Okolite-Okoprene self-supporting aerial cables

THESE Okolite-Okoprene self-supporting aerial cables illustrate one of the most important economy features of this type of cable. At its refinery in Robinson, Illinois, The Ohio Oil Company made use of an existing pipe and conduit structure to support the Okolite-Okoprene aerial cables.

Okolite-Okoprene was widely used on this refinery installation; primary distribution from the power house to the water distribution unit substation and to the crude unit substation—in all cases the most economical use was made of existing structures.

In addition to economy in installation, Okolite-Okoprene self-supporting aerial cable provides these further advantages:

- **a higher factor of safety**
- **improved voltage regulation**
- **less space requirements**
- **high resistance to weather extremes**
- **high resistance to chemicals and acids common to industrial areas**

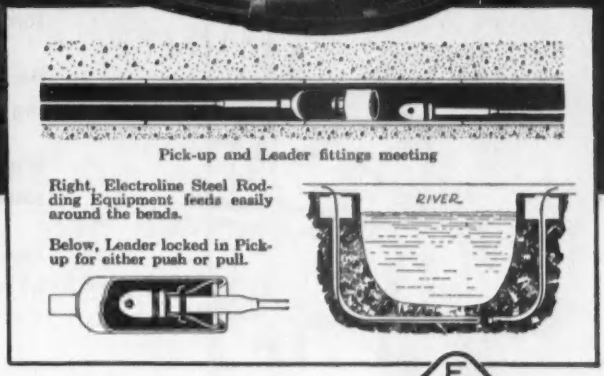
Okolite-Okoprene self-supporting cables have proved advantageous in virtually every industry in America. Write for Bulletin EW-1074, Okonite's complete data book on self-supporting cables. The Okonite Company, Passaic, New Jersey.

DESIGN, ENGINEERING, CONSTRUCTION AND PROCESSING SERVICE
J. F. Pritchard & Co., 210 West 10th Street, Kansas City, Mo.

OKONITE SINCE 1878 *insulated cables*

1858

10,000 FEET OF CONDUIT RODDED IN 8 HOURS!



Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.

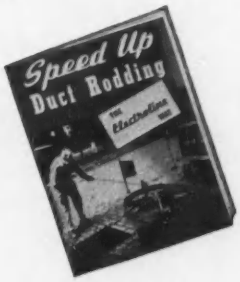
EASY DOES IT!—It's all in a day's work with Electroline Steel Duct-Rodding Equipment rodding 10,000 feet of conduit!

Light in weight, easily handled and stored, low upkeep: these are a few of the advantages utility men know to be true. But even bigger, more important advantages are—

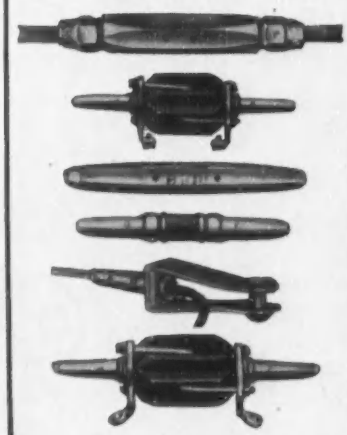
- *Savings in the cost of labor*—for example, where it formerly took two gangs from one to two weeks on a given job, one gang, *in one-half hour*, has completed the same job—using Electroline Duct-Rodding Equipment.
- *Savings in original cost*—you get long life—double that of other types—when you buy Electroline Duct-Rodding Equipment. Add to that this fact: this equipment costs just about half as much for equivalent capacity! *There's true economy.*
- *Savings in Total Investment*—fewer sets are required because of the speed with which a job is completed and the equipment moved to other locations.

Speed up installation, reduce your costs; start now to use Electroline Duct-Rodding Equipment. Available for 3", 3½" or 4" Duct.

We've got a 4-page brochure which describes and illustrates more completely how this equipment can benefit you. We'll gladly send you a copy. Write us.



OTHER *Electroline* PRODUCTS



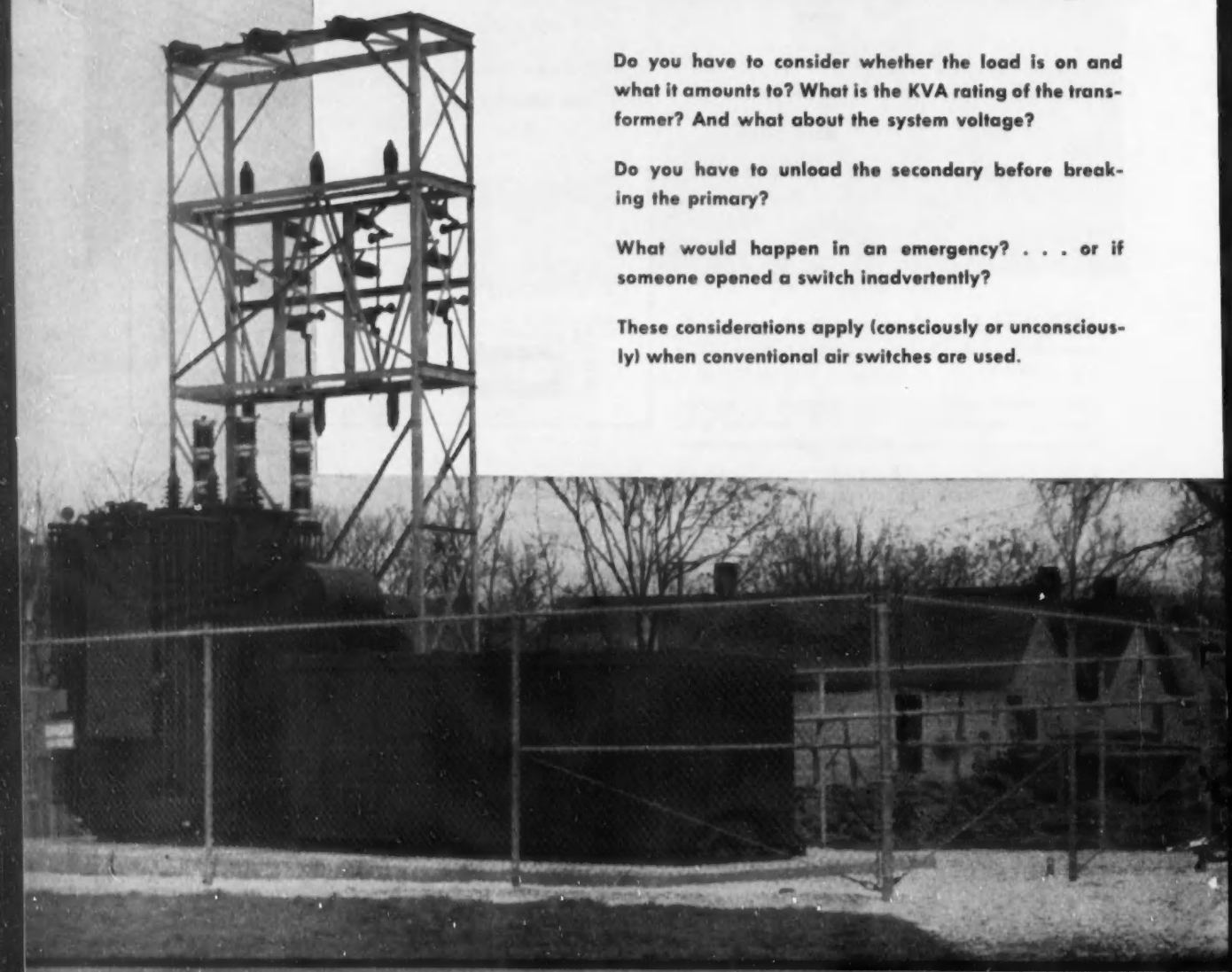
Electroline Company

4121 South La Salle St., Chicago 9, Ill.
In Canada: POWERLITE DEVICES, LTD., TORONTO

In Your Distribution Substations

WHAT DOES IT TAKE

to Switch the Primary?



Do you have to consider whether the load is on and what it amounts to? What is the KVA rating of the transformer? And what about the system voltage?

Do you have to unload the secondary before breaking the primary?

What would happen in an emergency? . . . or if someone opened a switch inadvertently?

These considerations apply (consciously or unconsciously) when conventional air switches are used.

SPECIALISTS IN HIGH-VOLTAGE

The S&C LOAD INTERRUPTER takes nothing but a pull on the handle

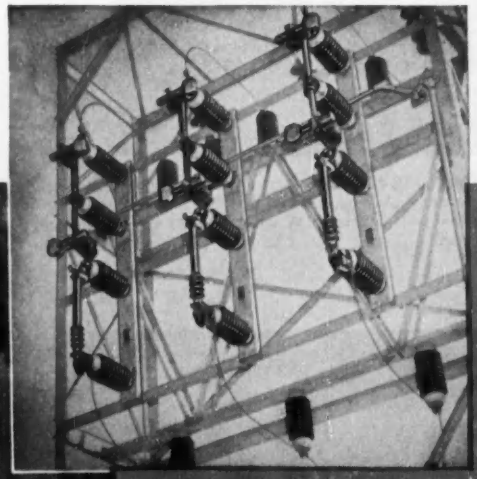
● The S&C Load Interrupter (Alduti Type) can break the primary circuit of a distribution substation any time under any condition (except short circuit) without endangering men or equipment. Switching cannot lead to dangerous phase-to-phase or phase-to-ground faults.

● When you break the magnetizing current, the break is positive—clean—decisive. (You don't have to "dog" it as a preliminary.) You are completely independent of wind velocity and wind direction.

● Then too you can break the magnetizing current of the larger transformers—an impossibility with conventional air switches.

● Under emergency conditions—or for protection against inadvertent operation—you can interrupt the entire load current of the substation. Thus you have two ways to drop the load—on either primary or secondary.

Do you have these operating advantages at your substations?



Inset shows a close-up of S&C Load Interrupters in service on the primary of a typical distribution substation.

S&C Interrupters bring new concepts of operating convenience, and new thinking in system layout. We will gladly send you this booklet containing detailed information about them.

S&C

ELECTRIC COMPANY

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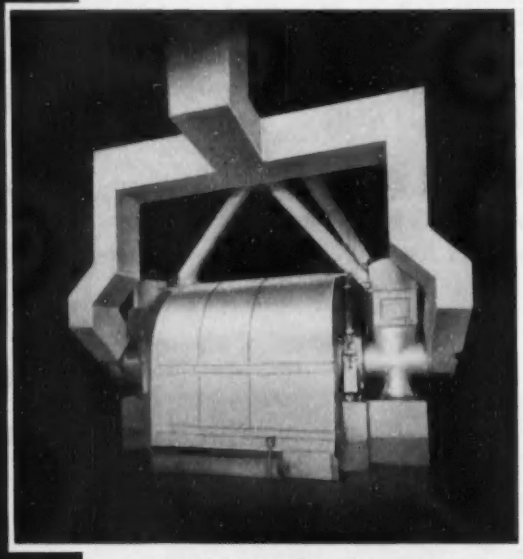
CIRCUIT INTERRUPTION

One source

... meets

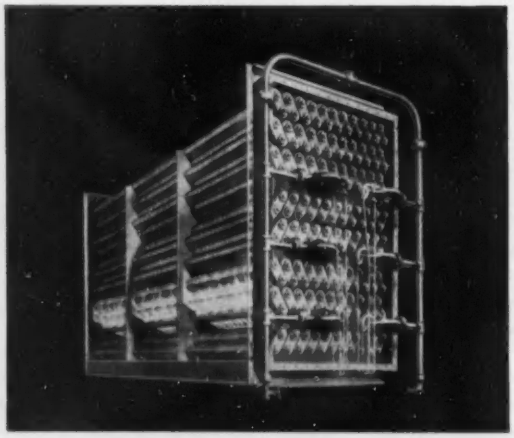
STEAM GENERATORS for every central station or industrial use, designed, engineered and built to meet your needs for the economies of higher temperatures and pressures over control ranges not previously obtainable.

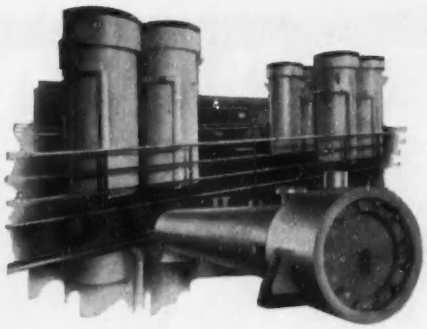


BALL MILL PULVERIZERS which grind hard, abrasive fuels to a constant fineness. Operating records show low maintenance, high availability of 99% or better.

SUPERHEATERS of the convection and radiant type, either singly or in combination. Superheat control over a wide load range is also offered as a means of positive and accurate control of final temperature.

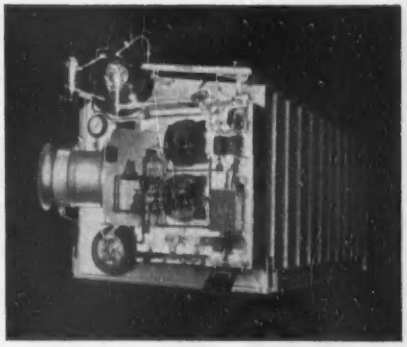
ECONOMIZERS of the cast-iron, extended-surface steel-tube type which are corrosion-resistant, impervious to soot fires, easily cleaned, and of unique, simple design. Bare tube construction also available.





PACKAGE STEAM GENERATORS in capacities of 10,000 to 30,000 lb. of steam per hr. Water-tube type, plant assembled, shipped ready to install. Design pressures of 250, 525, 825 psig provide operating pressures from 100 to 800 psig.

FEEDWATER HEATERS of the shell-and-tube type, as well as direct contact arrangements, are available. "Lockhead" closures have been built for pressures up to 3500 psi.



many of your steam plant needs

Only Foster Wheeler offers such a broad line of steam plant equipment engineered for increased efficiency through modernization.

IN OVER 50 YEARS of service to the power industry, Foster Wheeler has pioneered the development of steam generators, fuel systems, condensers and cooling systems of the highest efficiency. Continuous research and engineering have created a background of technical experience, *as well as* an integrated line of equipment in which each individual product is designed to contribute to the efficiency of all.

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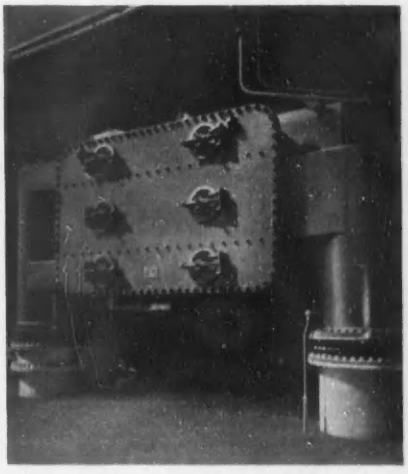
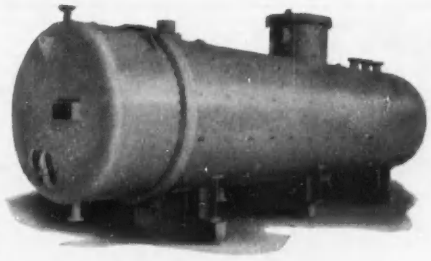
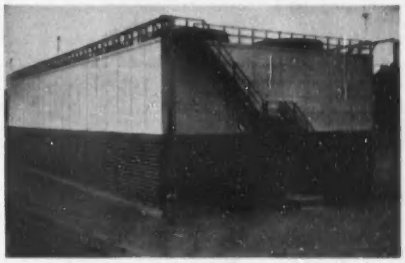


CONDENSERS to meet any conditions of headroom at any location. Our shops are fully equipped to supply units of 100,000 sq. ft. and larger.

EVAPORATORS for boiler feed make-up and of heat-transformer types in all sizes. Special types to handle raw and treated make-up to give the best thermal and descaling operation as well as producing pure vapor.





COOLING TOWERS custom-engineered to meet your requirements for greatest economy. Mechanical draft, counter-flow type. Provide minimum spray loss, flexibility to meet all weather conditions.

FOSTER WHEELER

DROP-FORGED

Stronger-Lighter

High Slip Strength

MINIMUM POWER LOSS

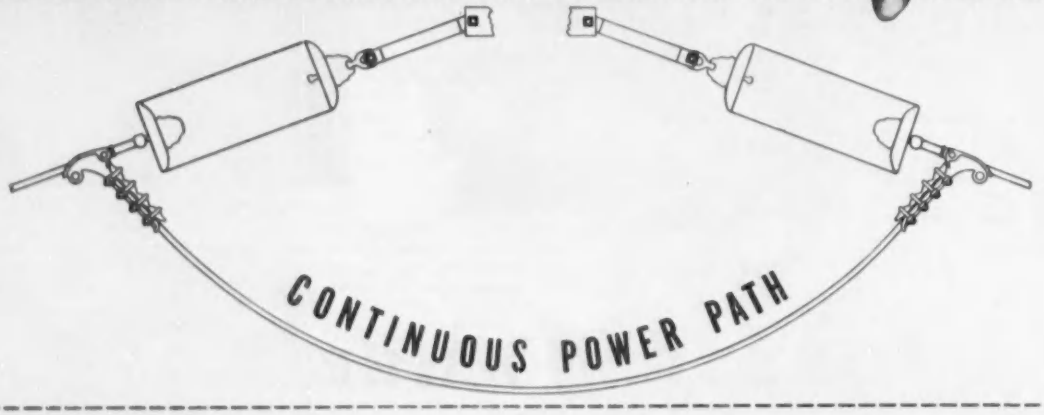
Increased Conductor Life

Economical

Efficient

Full Range of Sizes

Cool Operation



for GREATER STRENGTH

BTC

M.P.L. ALUMINUM
STRAIN CLAMPS
for A.C.S.R. and All-Aluminum Conductors

M.P.L. MINIMUM POWER LOSS
It has been proved that the use of a non-magnetic Aluminum Clamp Body reduces hysteresis and eddy current losses to a minimum. The actual power loss in M.P.L. Clamps is approximately one-tenth of that in all-ferrous Clamps.

HEATING EFFECT
High amperage current raises the temperature of the conductor within ferrous Clamps beyond safe limits, anneals the conductor, materially reduces its strength and fatigue resistance and has been the current-limiting factor on some systems. The clamped conductor and the M.P.L. Clamp operate at lower temperature than that in the span.

HIGH STRENGTH, LIGHT WEIGHT
Forgings, in any metal, are invariably employed where better strength, soundness and finish are required than can be obtained by other processes. Forging produces a fine, close-grained structure with grain flow following the contour of the part. It develops optimum mechanical properties and ability to withstand severe loading, sudden shock and frequent reversal of stress. The M.P.L. Clamp Body is Forged Aluminum alloy, fully heat-treated. In the heat-treated condition, the ultimate strength and hardness are more than twice (and the yield strength and endurance limit more than three times) that of alloys used in other processes. Catalogued strength ratings are conservative and are exceeded in actual tests. Undesirable weight is eliminated without sacrifice of strength.

SLIP STRENGTH
High holding power is attained by the combination of snubbing action and wave form body and keeper.

CONDUCTOR LIFE
M.P.L. Strain Clamps are designed to minimize the effects of conductor vibration. The light weight assembly with separate, rather than integral, connecting arms is free to oscillate at a point near to its center of mass, effecting a low moment of inertia and allowing the free passage of vibration waves. Generous snubbing radius of Clamp mouth prevents severe concentration of bending and tension stresses.

CORROSION
The close-grained, non-porous structure of the Forged Aluminum Alloy Body effectively prevents the destructive internal seepage of corrosive elements, disintegration of metal and eventual failure.

ECONOMICAL, PERMANENTLY EFFICIENT
M.P.L. Strain Clamps offer low initial cost—easy, quick installation —no cutting or lowering of the conductor— no special tools or cumbersome installation devices—no trouble inviting bolted jumper loop connectors—and no interruption of continuous power path through the jumper loop.

FULL RANGE OF SIZES
The M.P.L. line offers a choice of exactly the right Clamp for each size of A.C.S.R. or All-Aluminum Conductor. The close dimensional fidelity of the die-forged parts makes unnecessary any bore size allowance for manufacturing variations in the Clamps.

Specify BTC M.P.L. Aluminum Strain Clamps from your insulator manufacturer. They are an important part of BTC's complete line of forged transmission line hardware.

Sold Through Your Insulator Manufacturer Only

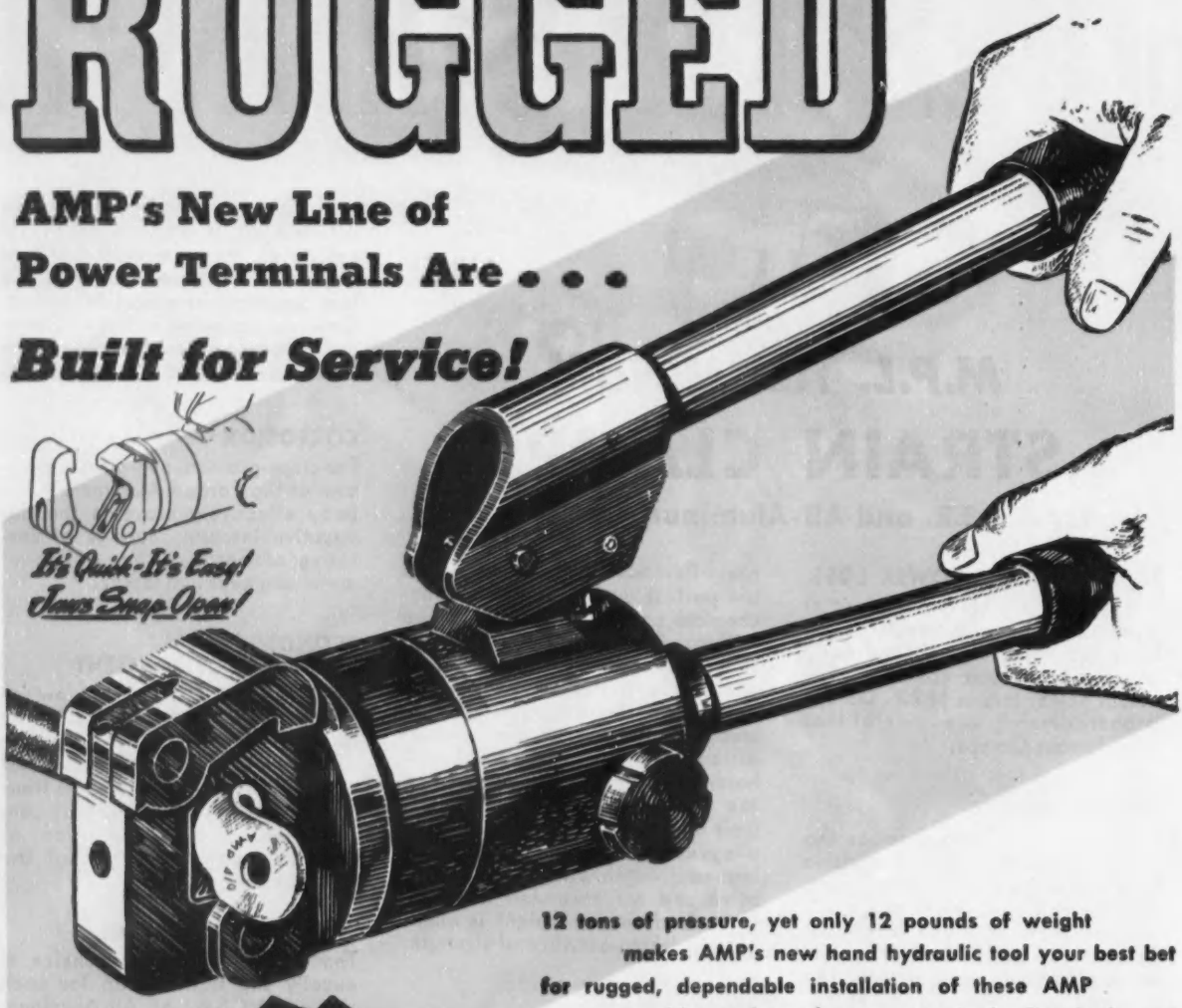
Drop Forged BTC *Hi-Line Hardware*

The BREWER-TITCHENER Corporation
Cortland · New York

RUGGED

AMP's New Line of Power Terminals Are . . .

Built for Service!



12 tons of pressure, yet only 12 pounds of weight makes AMP's new hand hydraulic tool your best bet for rugged, dependable installation of these AMP *precision-engineered* power terminals. Terminals and connectors are available in all ranges from #8 to #4/0. DESIGNED FOR USE ON ALL SHAPES OF WIRE: SOLID, STRANDED, SQUARE, OVAL, OR COMBINATIONS! Dies snap in and out easily. Tool automatically releases when crimping pressure is reached. Can be used with either pole strap or bench stand if desired. WRITE FOR SPECIAL POWER TERMINAL CATALOG.

AMP Trade-Mark
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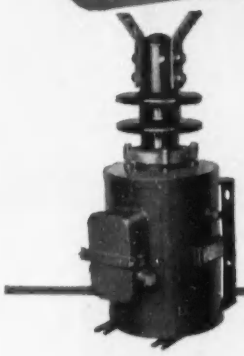
AMP

AIRCRAFT-MARINE PRODUCTS INC.
POWER TERMINAL DIVISION
2100 Paxton Street, Harrisburg, Pa.

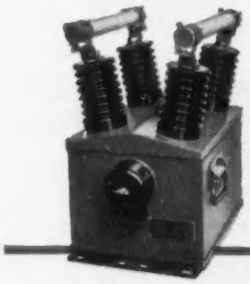
400 RATINGS

Fit Most Design Needs

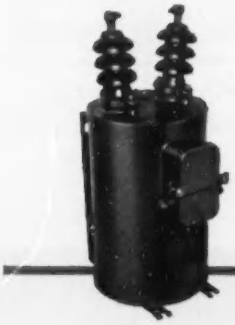
ALLIS-CHALMERS
INSTRUMENT TRANSFORMERS



All Allis-Chalmers instrument transformers are designed to meet ASA standards. At left: Outdoor current transformer, Type KO, rated up to 15 kv, 800 amp.



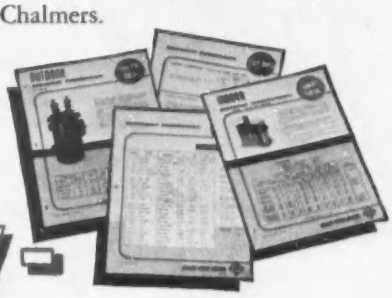
Thousands of these units are now in use with excellent operating records. At left: Indoor potential transformer, Type PD, fused or unfused, rated up to 14,400 volts.



All transformers are liberally designed for long service — built for easy mounting. At left: Outdoor potential transformer, Type PWD, rated up to 14,400 volts.

VIRTUALLY *every* instrument transformer requirement can be met from Allis-Chalmers 400 ratings of current or potential transformers or metering outfits. You can select dry-type, oil- or compound-filled units, depending on transformer rating, application, and location outdoors or indoors.

Every unit has the best combination of engineering and materials that 50 years of experience can provide. For top quality, wide selection, and quick delivery, it pays to specify Allis-Chalmers.

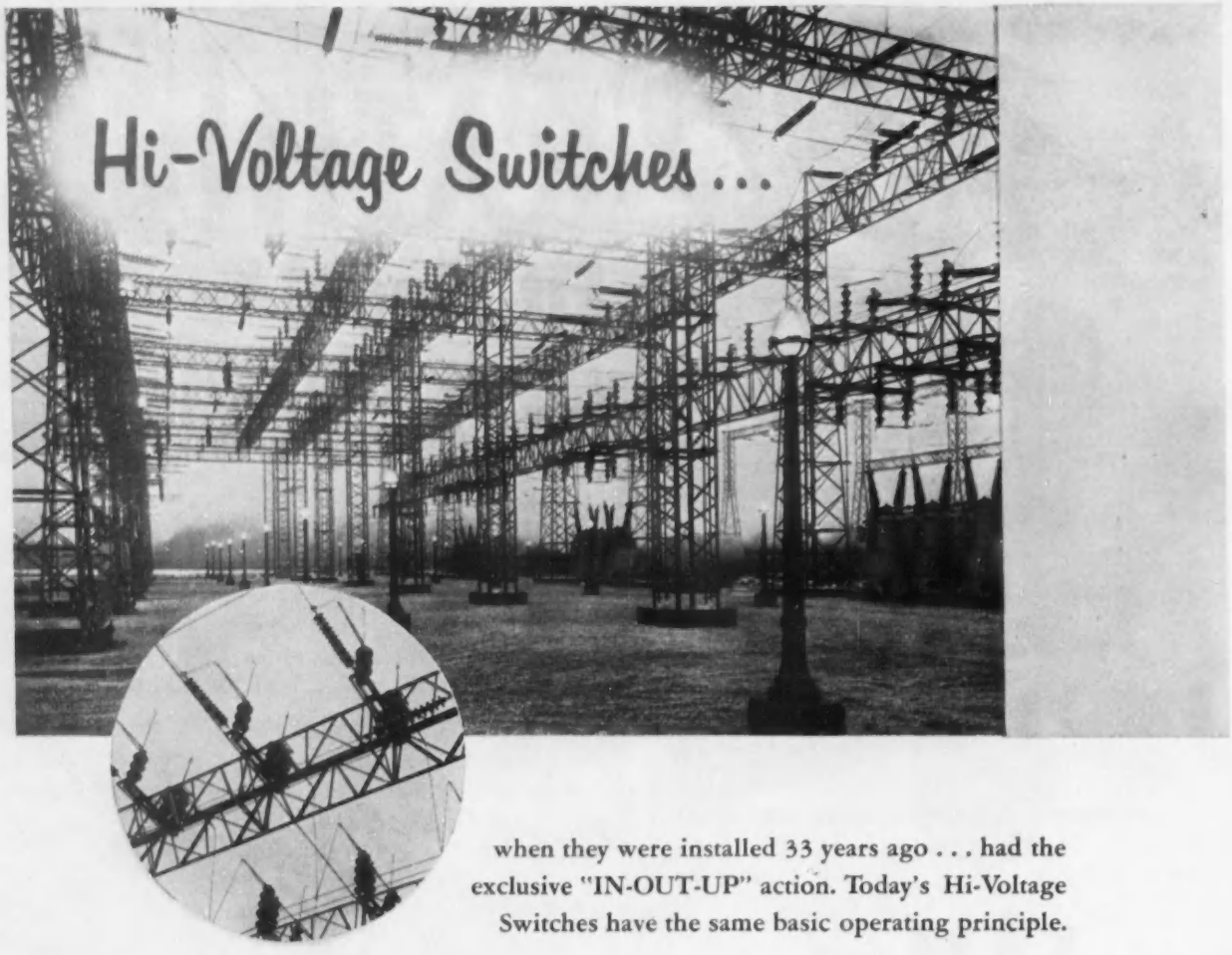


NEW—

Dimension Sheets Give Complete Details

Just off the press: all the mechanical and electrical information you need in a convenient, complete bound set of data sheets. Gives more detailed presentation of Allis-Chalmers complete line of standard instrument transformers than ever before. For your copy, contact your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4065

ALLIS-CHALMERS



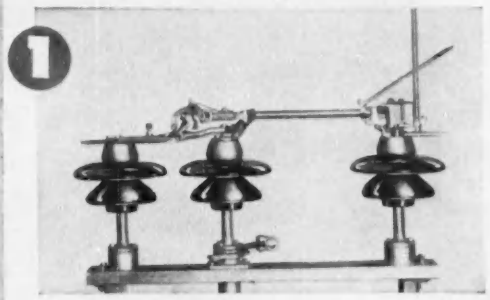
when they were installed 33 years ago . . . had the exclusive "IN-OUT-UP" action. Today's Hi-Voltage Switches have the same basic operating principle.

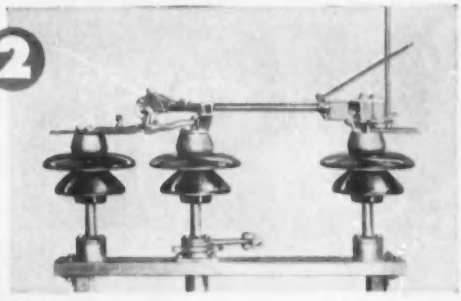
When a basic design is RIGHT, there is no need for periodic changes to keep it "in Mode". Consider a fundamental design, such as a *wheel.* You can change the bearings in it to lengthen life. A steel rim can be replaced by a rubber tire to assure quieter operation. But you cannot improve the *fundamental* design.

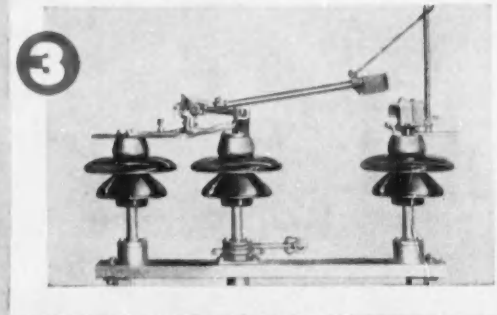
That's the way it is with Hi-Voltage Switches. Their fundamental design is NOT NEW. Rather, their exclusive "IN-OUT-UP" action has completely and successfully passed the test of time for over 33 years.

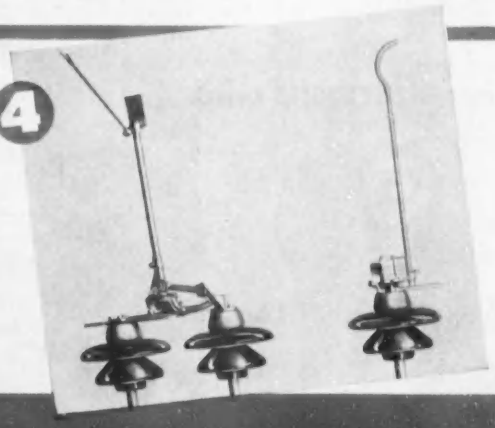
These switches assure Certain Operation any time . . . under any condition. Switches installed years ago take today's short circuits and overloads in stride . . . despite the rigors of northern winters and the deleterious effects of industrial corrosion.

HI-VOLTAGE

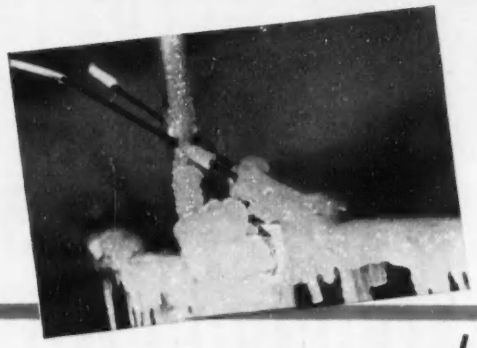








The "IN-OUT-UP" motion of Hi-Voltage Switches is the main reason for their unexcelled Service Records. Note that there is no undue stress or strain on any part of these switches. THERE IS NO TWISTING OR TURNING of switch arms and blades. The lateral bayonet-like thrust in and out of the contacts provides the easiest possible operation and the maximum mechanical advantage for ice and corrosion-seal breaking.



THE ICE-BREAKER CONTACT HOUSING

Whether the switch is closed or open during ice formation makes no difference. Operation is positive and certain. In the instance shown here, spray was directed into the blade end of the contact housing until more than an inch of ice had accumulated. Then the switch was closed at the speed of motor operation . . . not slammed. Operation was positive and CERTAIN with no hesitation.

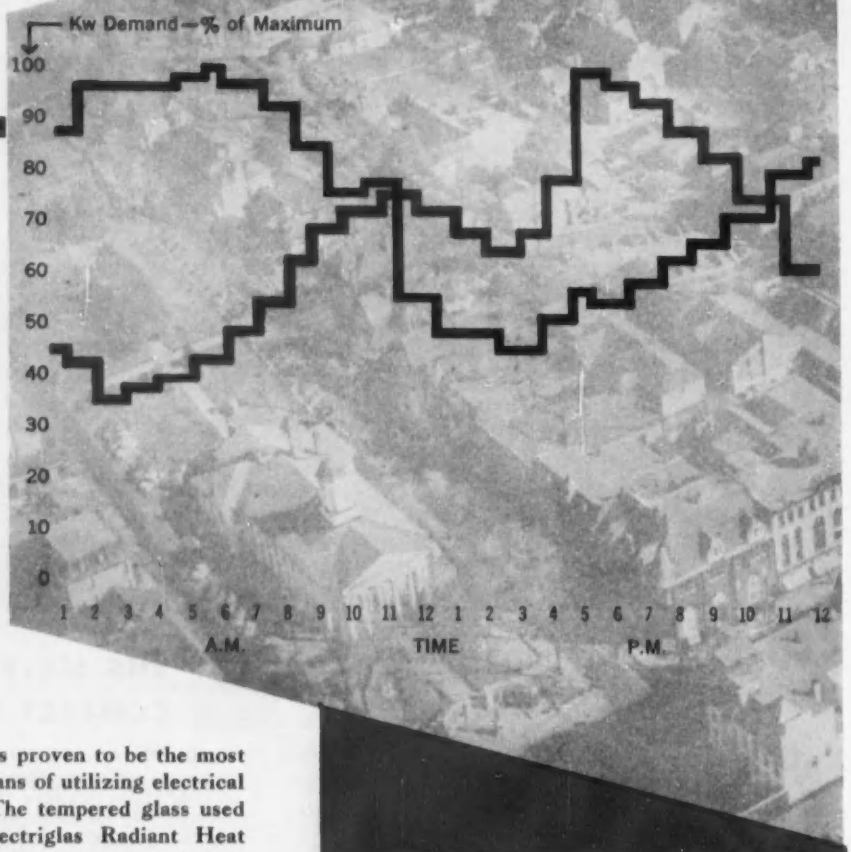
The EXCLUSIVE "IN-OUT-UP" action is just one of the many outstanding features of Hi-Voltage Switches. Ask your Joslyn Representative about:

SILVER positive-pressure contacts.
MONEL BALL BEARINGS that never require any lubrication.
DIRECT MECHANICAL operating mechanism.
LOWEST POSSIBLE installation costs.

HI-VOLTAGE EQUIPMENT COMPANY

4000 EAST 116TH STREET • CLEVELAND 5, OHIO

Here's the SCORE!



Average ELECTRIGLAS Load

Average Normal Load

RESULT... + Revenue for utilities with minimum Capital Expense

Electric glass panel heat has proven to be the most efficient and economical means of utilizing electrical energy for space heating. The tempered glass used in the manufacture of Electriglas Radiant Heat Panels has the ability to absorb, store and emit radiant heat, giving it an advantage over other resistance types of electrical heating equipment. This storage characteristic provides the advantage of cycling the panels . . . a plus factor for the utility company as only a percent of the connected load is demanded during the coldest periods. No discomfort is experienced as heat loss is compensated by storage of radiant heat in the glass.

Electriglas Radiant Heat provides the utility company with a method of leveling their load . . . it enables the utilities to attain the ultimate in providing to their customers, maximum satisfaction of better living through electricity. By controlling the load during the 4.30 P.M. to 6.30 P.M. period, a time interval when heat is least required and normal demand is peaked, electric glass panel heat can increase the total revenue to utilities, 7 to 10 times per customer without added capital investment.

ELECTRIGLAS CORPORATION

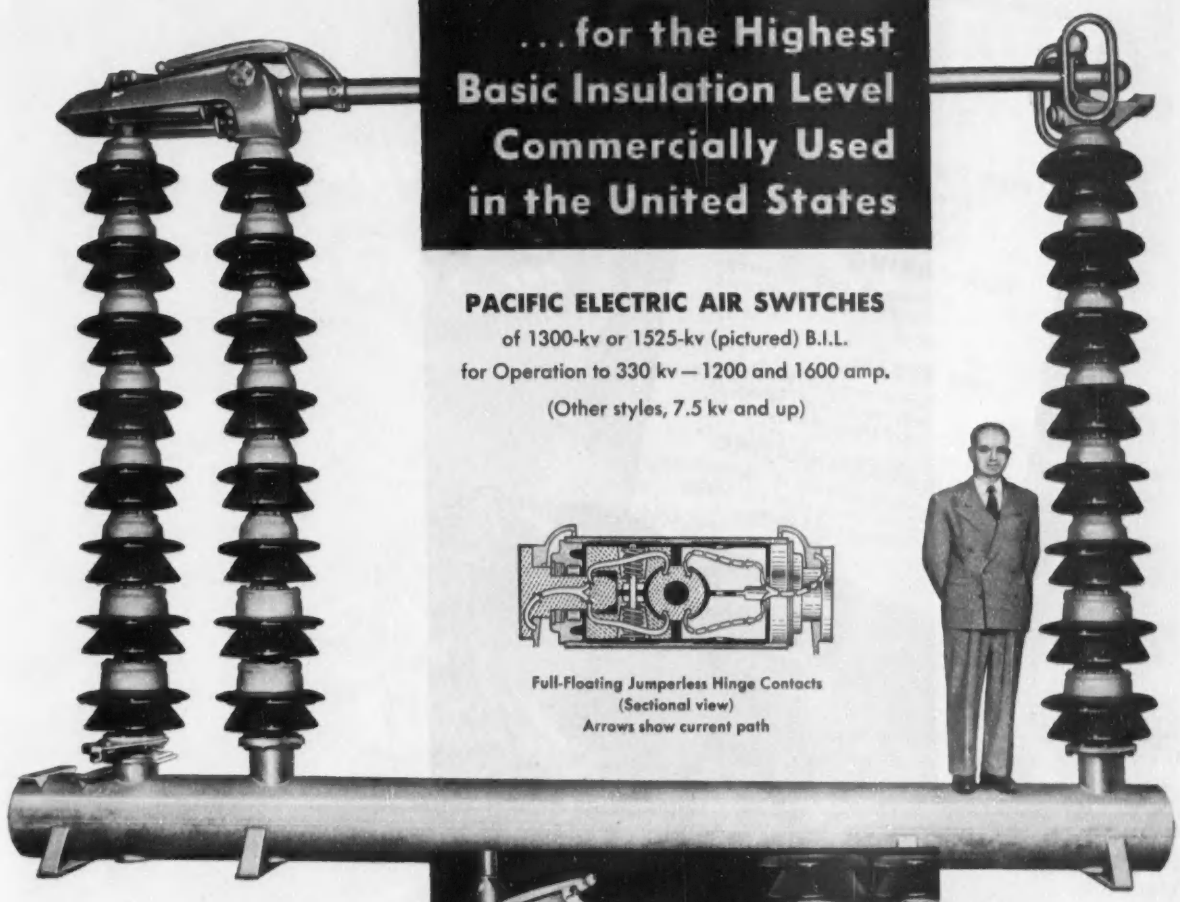
Bergenfield New Jersey

"It's hard to find a home not lighted by electricity . . . the time will come when it will be equally hard to find a home not heated by electricity."

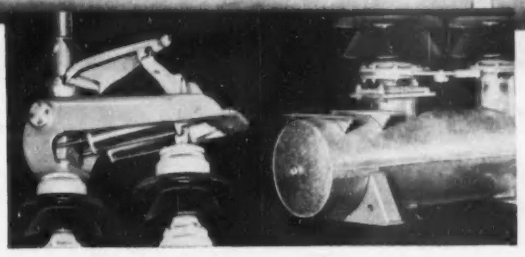
(Quoted from Electrical World)

. . . for the Highest Basic Insulation Level Commercially Used in the United States

PACIFIC ELECTRIC AIR SWITCHES
of 1300-kv or 1525-kv (pictured) B.I.L.
for Operation to 330 kv — 1200 and 1600 amp.
(Other styles, 7.5 kv and up)



Full-Floating Jumperless Hinge Contacts
(Sectional view)
Arrows show current path



At left:
Simplified
Three-Link
Blade Operator

At right:
Cylindrical
Anti-Torsion
Steel Base

THE PACIFIC Electric Type TG-4 Vertical-Break Air Switch shown in the illustration is a single-pole unit of an order recently completed for a large Western utility. Rated at 1200 amp, 1525-kv Basic Insulation Level, the switch is for operation at 287.5 kv or 330 kv.

Similar switches of 1300-kv Basic Insulation Level—also for operation at 330 kv, as is the practice on some systems—have one less insulator per stack.

The problem of stack rigidity of the insulators—increasingly serious as stack heights mount—is solved by use of a cylindrical base. Its section is ideally adapted to the torsional loading from rotary-insulator operation and from side winds.

OTHER FEATURES, which also apply to all Type TG switches, 115 kv and up

- Solid-silver inserts at opening-end and hinge-end contacts.
- Sealed weatherproof housing encloses full-floating hinge-end contacts. Flexible jumpers are not used.
- Twin counterbalance springs in weatherproof housings assure easy operation at all positions of stroke.
- Roller, ball, and oilite bearings, hardened and ground stainless-steel pins, precision machining, and generous proportioning of parts characterize the mechanical design.

. . . Write for Catalog No. 129 for further information

Since 1906

SALES OFFICES or AGENCIES
in PRINCIPAL CITIES

PACIFIC ELECTRIC • MFG. CORPORATION •

SUBSIDIARY OF FEDERAL ELECTRIC PRODUCTS COMPANY
5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA
OTHER FACTORIES: SANTA CLARA, CALIF.; SCRANTON, PENNA.

FOR POWER
Bituminous of every type for efficient burning in the latest pulverized-fuel installations
FOR COKING
Bituminous coals of exceptional quality for by-product coking
FOR STEAM
Firm-structured Bituminous with high heat values for every steam-plant use
FOR SPACE HEATING
Many varieties of non clinkering coals ideal for stoker use and hand firing
Always ready to serve you...

with a coal that's exactly right

Name your choice—in "Bituminousland" along the Baltimore & Ohio, we have it! Here Nature has stored a supply of economical heat and energy sufficient to last for centuries.

B&O Bituminous coals exist in wide variety. The mines that produce them are thoroughly mechanized so that costs are kept low, size and quality uniform. Nearness to industrial centers results in low transportation costs, and the ease of storing removes the need for expensive facilities. Furthermore, new methods and equipment have increased the burning value of Bituminous.

ASK OUR MAN! Let him direct you to the best coal for your needs, and explain proper firing methods. You'll be more than pleased at the improved efficiency, economy, and cleanliness of B&O Bituminous.

BITUMINOUS COALS FOR EVERY PURPOSE

BALTIMORE & OHIO RAILROAD

Constantly *doing things*—better!

CUT OVERHEAD EXPENSE ON YOUR OVERHEAD LINES WITH Copperweld

TRADE MARK

POWER CONDUCTORS

SHIELD WIRES

GUY AND MESSENGER STRAND

GROUND RODS AND CLAMPS

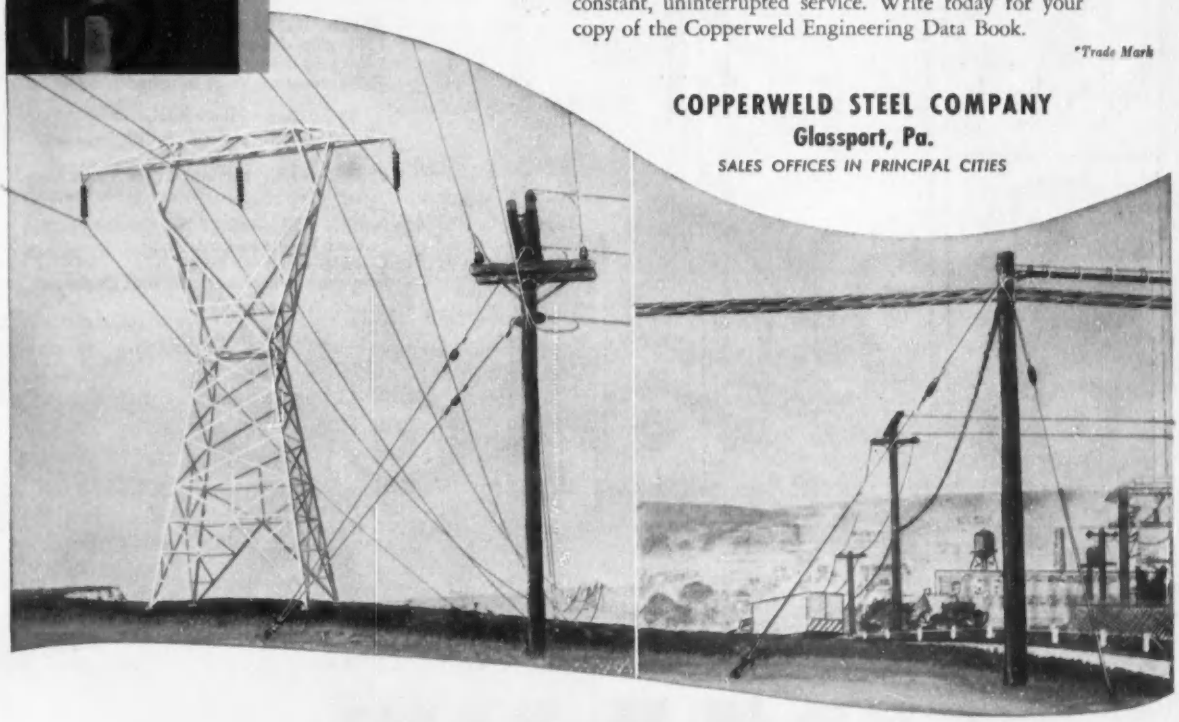
For over 38 years Copperweld* Products have provided dependable service to the Electrical Industry. Their trouble-free performance has been proved by time. Their lowest annual cost is a matter of record.

When you build with Copperweld Products, you get the long life and conductance of copper inseparably molten-welded to a core of high strength steel. And because Copperweld can't rust, this original high strength is retained for the life of the installation. This means your overhead lines will have the stamina to stand up under all types of operating conditions.

Profit by the experience of many of the world's leading power companies, railroads, and communication systems. Specify Copperweld Conductors, Shield Wires, Strand and Ground Rods for your overhead lines. There is no better way to keep the power load up, keep overhead down and be assured of constant, uninterrupted service. Write today for your copy of the Copperweld Engineering Data Book.

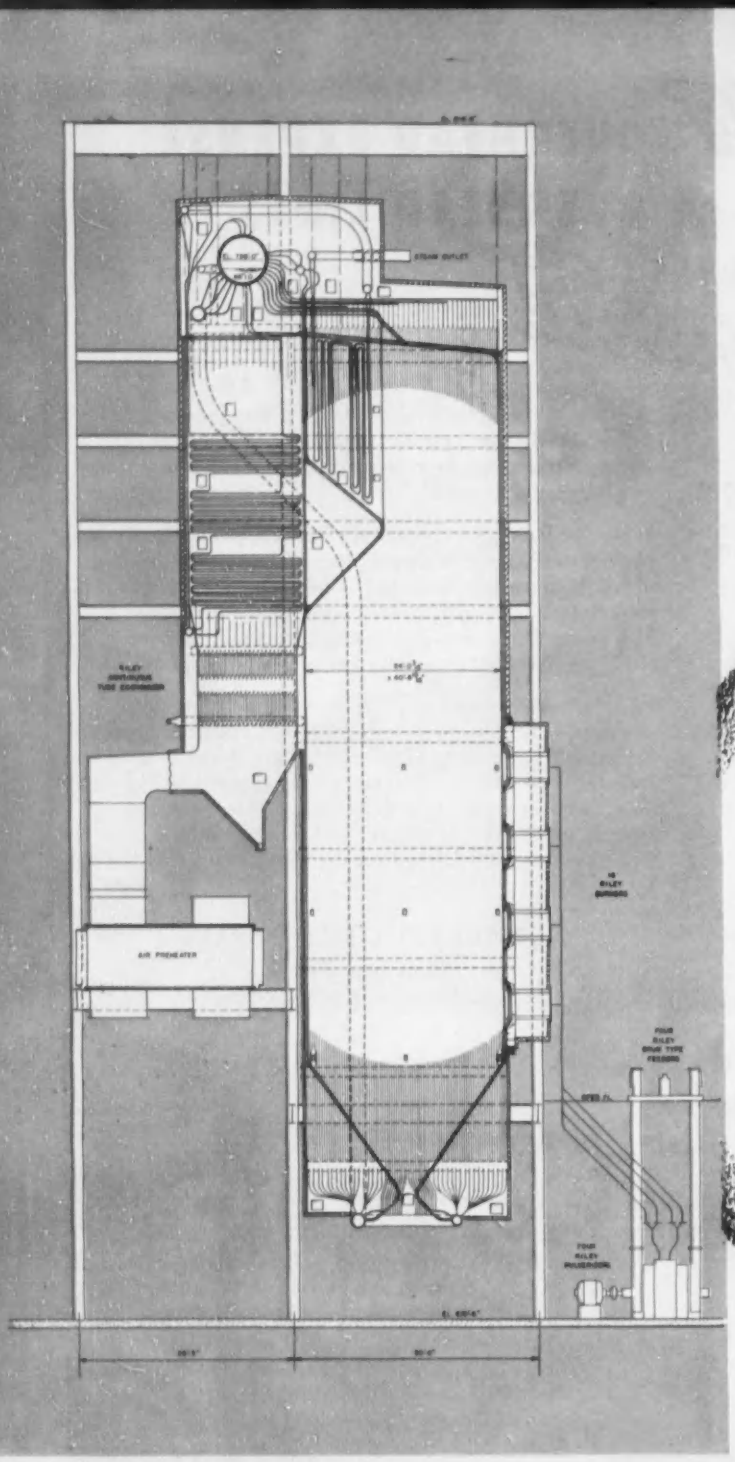
*Trade Mark

COPPERWELD STEEL COMPANY
Glassport, Pa.
SALES OFFICES IN PRINCIPAL CITIES



Copperweld TRADE MARK **PRODUCTS**

Cost Less BECAUSE THEY *Last Longer*



RILEY *adds another public utility to its growing list of users -*

Outdoor Unit for Columbus and Southern Ohio Electric's Picway Station is Designed for Operation with Ohio Strip Mine Coal under Peaking Load Conditions

900,000 lbs./hr. capacity
1500 psig design at superheater outlet
1350 psig operating pressure
950°F. temperature at superheater outlet

Furnace Heat Releases

13,500 B.T.U. per cu. ft. of furnace volume
85,000 B.T.U. per sq. ft. of furnace envelope

Furnace Width—40'7"
Furnace Depth—24'0 3/16"
Over-all efficiency 86.5%
Commonwealth Associates, Inc., Engineers

A survey of your power plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs.

RILEY
STOKER CORPORATION

WORCESTER, MASS.
Boston, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Tulsa, Houston, Denver, Salt Lake City, Los Angeles, San Francisco, Portland, Seattle

COMPLETE STEAM GENERATING UNITS

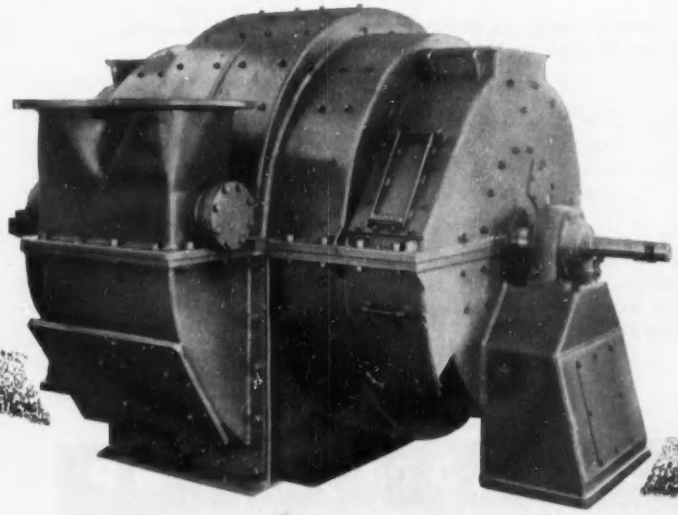
BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • ECONOMIZERS
WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

Columbus and Southern Ohio Electric Company to install this 900,000 pounds per hour Riley Steam Generating Unit

Clean and liberal design is one reason why acceptance of Riley equipment by public utility power engineers continues to maintain steady growth. This installation for Columbus and Southern Ohio Electric Company adds another unit to Riley's long list of sales to new and old customers.

Some Recent Riley Customers • • • • • •

If your company is considering additional steam generating facilities, it will pay you, as it has so many others, to investigate thoroughly the advantages of working with Riley.



Four Riley No. 550 Pulverizers for Quiet, Vibrationless Operation at Wide Load Ranges

Pulverizing parts faced with *erosion resistant* Tungsten Carbide assure sustained high fineness and low maintenance cost per ton over months of continuous operation. Capacity of each pulverizer is fifteen tons per hour.

New Orleans Public Service, Inc.
975,000 lbs./hr. 1750 psig design and 1005°F. Pressurized Furnace

Public Service Co. of Indiana, Inc.
805,000 lbs./hr. Reheat. 2075 psig, 1005°F. and 1005° Reheat
Sargent & Lundy, Engineers

Houston Lighting & Power Co.
2—1,250,000 lbs./hr. Reheat
2125 psig, 1005°F. and 1005° Reheat. Pressurized Furnace
Ebasco Services, Inc., Engineers

Dallas Power & Light Co.
1,050,000 lbs./hr. Reheat
1550 psig, 1005°F. Pressurized Furnace
Ebasco Services, Inc., Engineers

Texas Electric Service Co.
1,250,000 lbs./hr. Reheat
2125 psig, 1005°F. and 1005° Reheat. Pressurized Furnace
Ebasco Services, Inc., Engineers

Louisiana Power Company
1,000,000 lbs./hr. Reheat
1725 psig, 1005°F. and 1005° Reheat. Pressurized Furnace
Ebasco Services, Inc., Engineers

City of Los Angeles
Department of Water & Power
2—1,200,000 lbs./hr. Reheat
2075 psig, 1000°F., 1000° Reheat

Monongahela Power Company
The Potomac Edison Co.
2—700,000 lbs./hr. 1050 psig, 905°F.
Sanderson & Porter, Engineers

Southwestern Gas & Electric Co.
630,000 lbs./hr. 1025 psig, 1005°F.—Pressurized Furnace
Sargent & Lundy, Engineers

Central Illinois Light Co.
500,000 lbs./hr., 950 psig, 900°F.
Commonwealth Services, Engineers

Northern States Power Co.
385,000 lbs./hr., 1500 psig, 950°F.
Pioneer Service & Engineering Co., Engineers

South Carolina
Public Service Authority
460,000 lbs./hr., 1025 psig, 900°F.
Ford, Bacon & Davis, Engineers

Iowa Electric Light & Power Co.
300,000 lbs./hr., 975 psig, 910°F.

South Carolina Gas & Electric Co.
400,000 lbs./hr. 1475 psig, 955°F.
Gilbert Associates, Engineers

Utah Power & Light Co.
620,000 lbs./hr. 1500 psig, 955°F.
575,000 lbs./hr., 1700 psig, 1000°F., 1000° Reheat
Bechtel Corp., Engineers

Arkansas Power & Light Co.
650,000 lbs./hr., 1050 psig, 905°F.
Ebasco Services, Inc., Engineers

Gulf Power Company
325,000 lbs./hr., 1800 psig, 900°F.
Southern Services, Engineers

Iowa-Illinois Gas & Electric Co.
250,000 lbs./hr., 975 psig, 905°F.

Ohio Edison Co.
225,000 lbs./hr., 975 psig, 900°F.
Commonwealth Services, Engineers

Mississippi Power Co.
230,000 lbs./hr., 925 psig, 850°F.
Southern Services, Engineers

Interstate Power Co.
200,000 lbs./hr., 725 psig, 910°F.
Sargent & Lundy, Engineers

Southwestern Public Service Co.
330,000 lbs./hr., 1050 psig, 900°F.

Left: Unretouched photograph of clogged intake at the Old Badger Plant, City of Kaukauna, Wisconsin (not mechanically cleaned). Compare this with the New Badger Plant (at left).

New Plant mentioned in which intake is cleaned with a Leonard trash rack rake. Both plants draw water from the same canal.

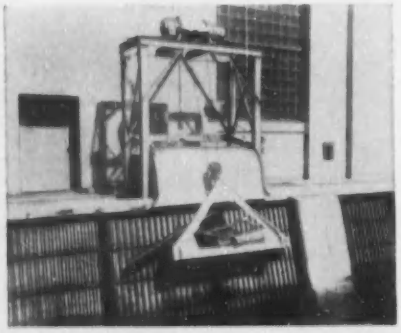
MAINTAIN *MAXIMUM HEAD*

SAVE POWER LOSSES AND OPERATING EXPENSES with the

LEONARD TRASH RACK RAKE

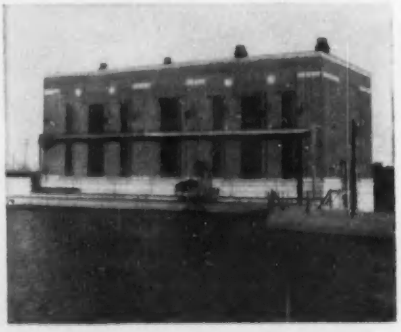
AT INTAKES TO HYDRO-ELECTRIC PLANTS, STEAM POWER PLANTS AND PUMPING STATIONS which removes leaves, river grass, lily pads, branches, logs, pulp wood, or other extraneous matter which gather on the racks to obstruct the water supply.

LEONARD raking equipment is specified by many of the country's leading Engineers, as well as public works agencies such as the U. S. Engineers, and Bureau of Reclamation. Write for our Bulletin 158 and list of installations.



Left: Leonard raking unit at the St. Mary's Falls Hydro-Electric plant, Michigan; a U. S. Engineers project.

Right: View of forebay and power house at the Thilmany Plant, City of Kaukauna, Wisconsin. In addition to the Leonard rakes at this plant and the New Badger plant, the City also has one at its Little Chute plant.

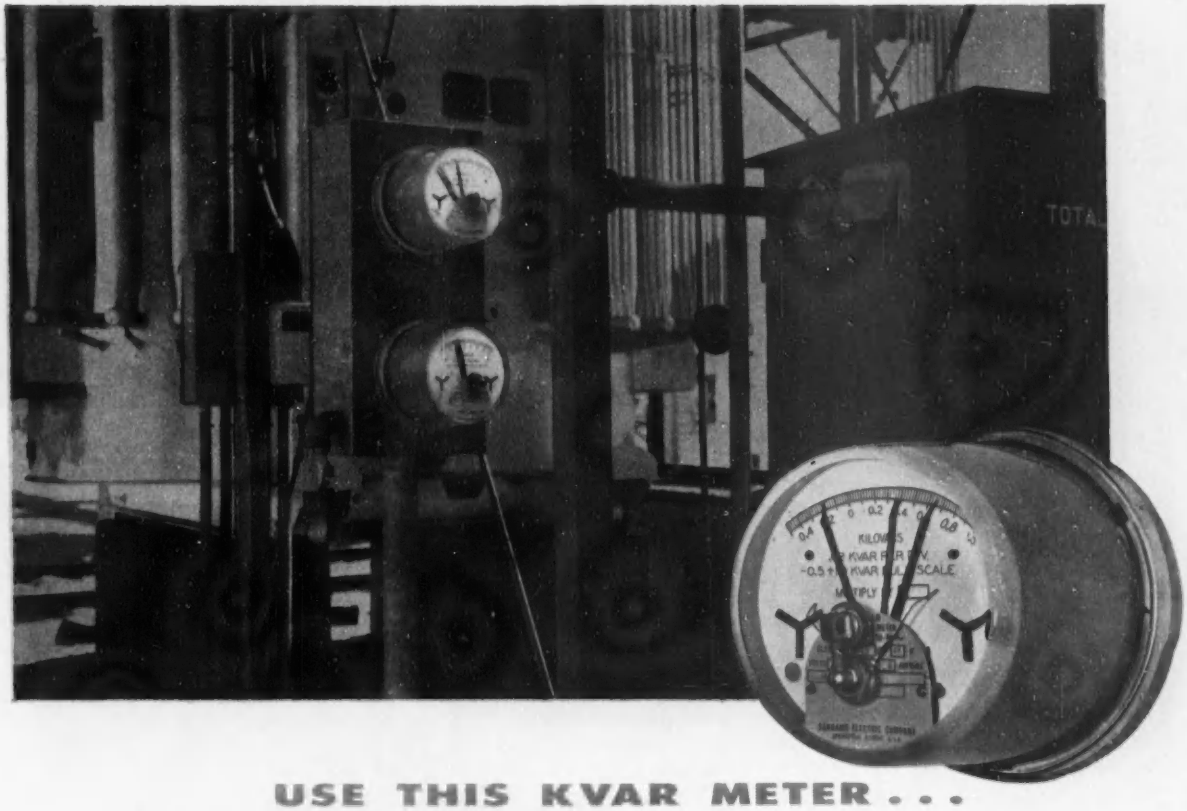


POWER by SMITH — 16,000,000 HP

76 YEARS EXPERIENCE DESIGNING AND MANUFACTURING HYDRAULIC TURBINES AND ACCESSORY POWER PLANT AND PUMPING STATION EQUIPMENT

S. MORGAN SMITH CO. York, Pennsylvania

KNOW THE REACTIVE IN YOUR SYSTEM



USE THIS KVAR METER . . .

one of the Lincoln "Indicating Meters with a Memory"

Distribution engineers are increasing system capacity by the application of capacitors to correct for reactive power which may be limiting full use of present facilities. This practice also effects economies in operation. However, accurate knowledge of the load at all times is vital to proper capacitor application.

Permanent installations of Lincoln KVAR Indicating Meters give these necessary facts. They tell the existing reactive demand, whether lagging or leading, and remember the full variation of the KVAR demand which occurred since resetting. Lincoln Meters are rugged and accurate, and they require practically no maintenance.

Full information is given in Bulletins 440 and 410. They're yours for the asking.

* * *

Have you received your copy of "Solving Distribution System Problems through Measurement"? It provides the answer to your load growth problems. We'll be glad to send you a copy.

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Only Measured Facts are Known Facts

This $11.00 worth of preformed splice rods saved $2000.00 for Louisiana Power & Light

WHERE: At 450-foot, West-Bank Tower of 3950-foot Mississippi River crossing of Louisiana Power & Light Company.

CAUSE OF DAMAGE: Flash storm loosened wire rope used for holding painting rigging. Rope lashed around energized lower phase wire of downstream circuit.

DAMAGE: Five outer strands of aluminum and five inner strands of steel were burned completely in two, reducing or impairing the tensile strength by an estimated 10,000#.

REPLACEMENT of the 3,950-ft. conductor span would have cost about $1,500 (not including labor) and necessitated an outage of at least 24 hours ($7,680 revenue at 4-mill rate).*

THE ANSWER: At the request of W. L. "Bo" Rush, Transmission Engineer of Louisiana Power & Light Company, Preformed Line Products Company designed and delivered a set of Preformed Splice Rods. How they were installed is shown on the opposite page.

This is just another example of how PLP PROGRESSIVE IDEAS . . . backed by a combination of research, engineering, operations and sales service . . . insure the ultimate in FIELD PERFORMANCE.

*From W. L. Rush article "115-KV Conductor Repaired in 14 Min." Ask for a copy of it.

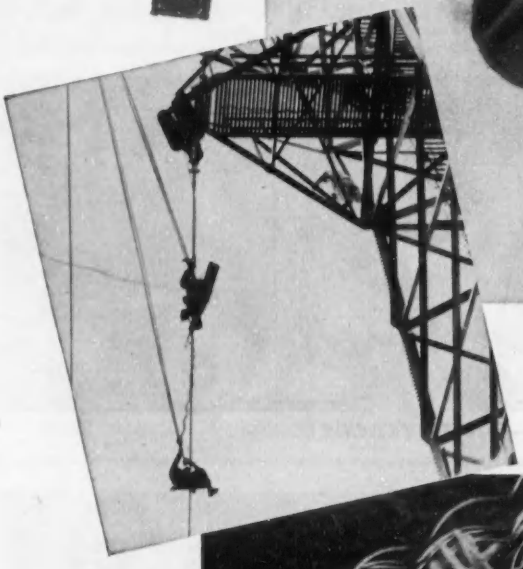
PLP

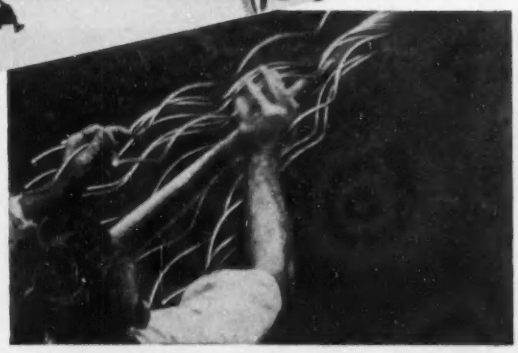
PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

TELEPHONE: CLEVELAND EXpress 1-3571

The Times-Picayune—New Orleans States





After getting in position, Paul Matthews, Contractor, and his assistant, Jack Turner, spent 10 minutes cleaning the conductor to be covered. Then they wrapped the 10½-foot Preformed Splice Rods, around the conductor, two at a time. They used only their hands, *no tools.* In just 14 minutes, the wrapping was complete. The entire job, including hauling equipment up and down the tower and rigging the bosun's chairs, took less than two hours.

SALES REPRESENTATIVES:

C. B. Anderson Co., *Tulsa* ● **Bergstrom-Verbarg Co.,** *Minneapolis* ● **Vincent J. Brown Co.,** *Buffalo* ● **Burns Electric Co.,** *Pittsburgh* ● **Earl S. Condon Co.,** *Los Angeles* ● **Cory and Crum,** *Indianapolis* ● **The Electrical Distributors Co.,** *Philadelphia* ● **Engineer Sales Co.,** *St. Petersburg* **JSG Electric Co.,** *Chicago* ● **E. L. Flowers,** *Boston* ● **George R. Herne & Co.,** *Dearborn* ● **Johnson Sales Co.,** *Bay City* ● **H. L. Macon & Co.,** *Atlanta,* **Peterson Co.,** *Denver* ● **Elgin B. Robertson, Inc.,** *Dallas* ● **Elgin B. Robertsen Co.,** *Houston* ● **K. M. Ryals Co.,** *San Francisco* ● **Shaffer and Nelson,** *Portland, Seattle, Spokane* ● **M. H. Snyder & Sons,** *New York* ● **Curtis H. Stout,** *Little Rock, Memphis, New Orleans* ● **L. G. Wendegatz,** *Kansas City*

ASPLUNDH CONTINUALLY IMPROVES ITS UTILITY

With Schools for General Foremen Dealing in Every

ASPLUNDH'S knowledge, experience and modern equipment for Line Clearance — Right-Of-Way Clearing — and Chemical Brush Control — is vitally important in its specialized work. But — equally as important is the proper application of company policy, performance standards and mechanical aids for the job.

ASPLUNDH SCHOOLS are held to accomplish this — whereby workers become familiar with each and every phase of Line Clearance Work. Result: the kind of job you want! — better public relations — better clearances for uninterrupted service! Another Asplundh "plus value"!

The thoroughness of the schools is depicted in these action photographs . . .

3—TRUCK MAINTENANCE

4—SAFETY PRACTICES

7—POWER SAW OPERATION

8—MECHANICS OF CHIPPERS

UTILITIES WHO LOOK BEHIND THE TITLE
use **ASPLUNDH**

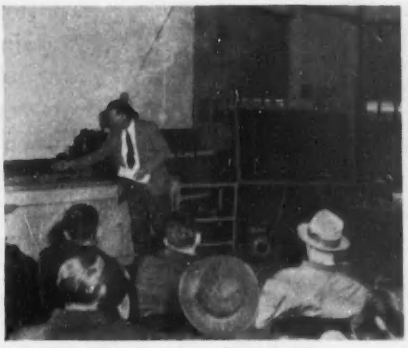
LINE CLEARANCE SERVICE

Phase of Its Specialized Work . . .

1—COMPANY POLICY—PROCEDURE

2—TRUCK INSTRUCTION

5—FIRST AID INSTRUCTION



6—POWER SAW DISCUSSION

9—USE OF CHIPPERS

10—USE OF NEW DEVICES

ASPLUNDH TREE EXPERT COMPANY

JENKINTOWN • PENNSYLVANIA

means:

Trained Treemen
Experienced Foremen
Superior Supervision

Public Relations
Specialized Equipment
Safe Operation
Complete Insurance

Efficiency Incentives
Nation-Wide Service
Sound Administration

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Arlington
San Antonio
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Alexandria

*New England Tree Expert Co. (Affiliate).

new Thomas "Chip-Proof" insulator

A new corrugation design positively prevents chipping or breaking of inner petticoats. This protection is assured by eliminating the destructive bumping of caps or clamp fittings against the petticoats, yet gives complete interchangeability with all current designs as required by NEMA Standards. Only this new Thomas design (Patent applied for) can guarantee the virtual impossibility of damaging inner petticoats by rough handling during assembly or disassembly in the field.

• Naturally, we are excited. We believe our new petticoat design to be the answer to the insulator breakage problem, during construction, which has plagued the Industry for years. This design accomplishes positive elimination of insulator breakage during construction due to rough handling in coupling and uncoupling insulator units and in installing hardware fittings to the insulator strings.

Of course, the greatest benefit of this new design will be realized with the close-coupled units, but for all insulator spacings, our new design assures more ruggedness with resulting longer life . . . and at no additional cost to you!

The foregoing are bold statements. However, our most severe tests prove them and they are too important for you not to verify.

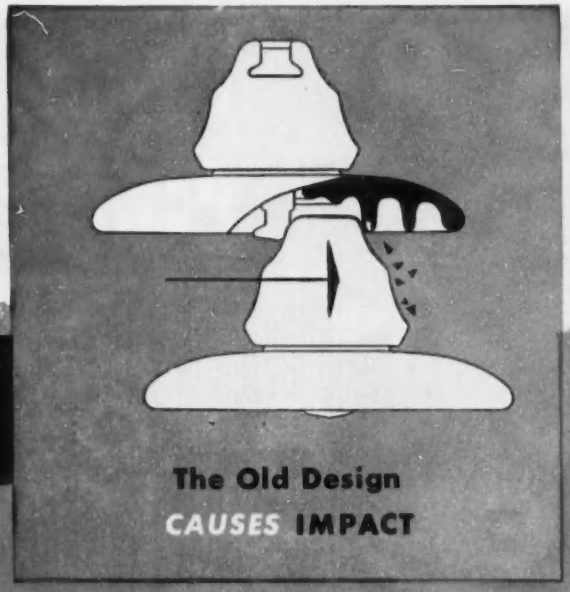
We suggest that you order TODAY, a standard crate of 6—No. 21239 THOMAS 1953-DESIGN SUSPENSION INSULATORS. Test them thoroughly . . . and compare with other close-coupled designs.

The R. Thomas and Sons Co.

1873 THOMAS INSULATORS our 80th year RELIABILITY 1953

LISBON, OHIO
NEW YORK CHICAGO

Sales Representatives: **C. G. Anderson, *Chicago* • E. B. Anderson Co., *Detroit* • Conrad R. Bangh, *Omaha* • Ken H. Best, *Seattle* • Nellis B. Bronner, Jr., *Syracuse* • R. E. Cunningham & Son, *Los Angeles* • W. H. Eddy Electric Products, Inc., *Phoenix* • Engineer Sales Co., *St. Petersburg* Electrical Distributors Co., *Philadelphia* • Hamilton Associates, *Denver* • Geo. E. Henn Co., *San Francisco* • Hugo Sales Co., *Minneapolis* • J. P. Lane Co., *St. Louis* • John G. Pettijohn Co., *Knoxville* • H. E. Ransford Co., *Pittsburgh* • J. F. Schaefer & Co., *Kansas City* • R. J. Sullivan Co., *Boston* Tafel Electric & Supply Co., *Louisville* • Walter E. Thompson Co., *Birmingham* • Triangle Electric Supply Co., *El Paso* • United Electric Supply Co., *Salt Lake City* • Williamson Sales Co., *Shreveport, Amarillo, Corpus Christi, Dallas, Houston, New Orleans, Pine Bluff* • *Representatives in other principal cities***



eliminate *Impact* and you eliminate breakage

For many years, The R. Thomas and Sons Company has been well aware of the insulator breakage problem during construction. But none of us imagined the solution to be so simple and yet so effective.

Examine carefully the two drawings above. Note that with the OLD design (illustrated at the left) when the lower insulator is uncoupled, it can easily be SLAMMED directly in a straight line against the innermost petticoat. Obviously, this action results in a chipping or breaking IMPACT.

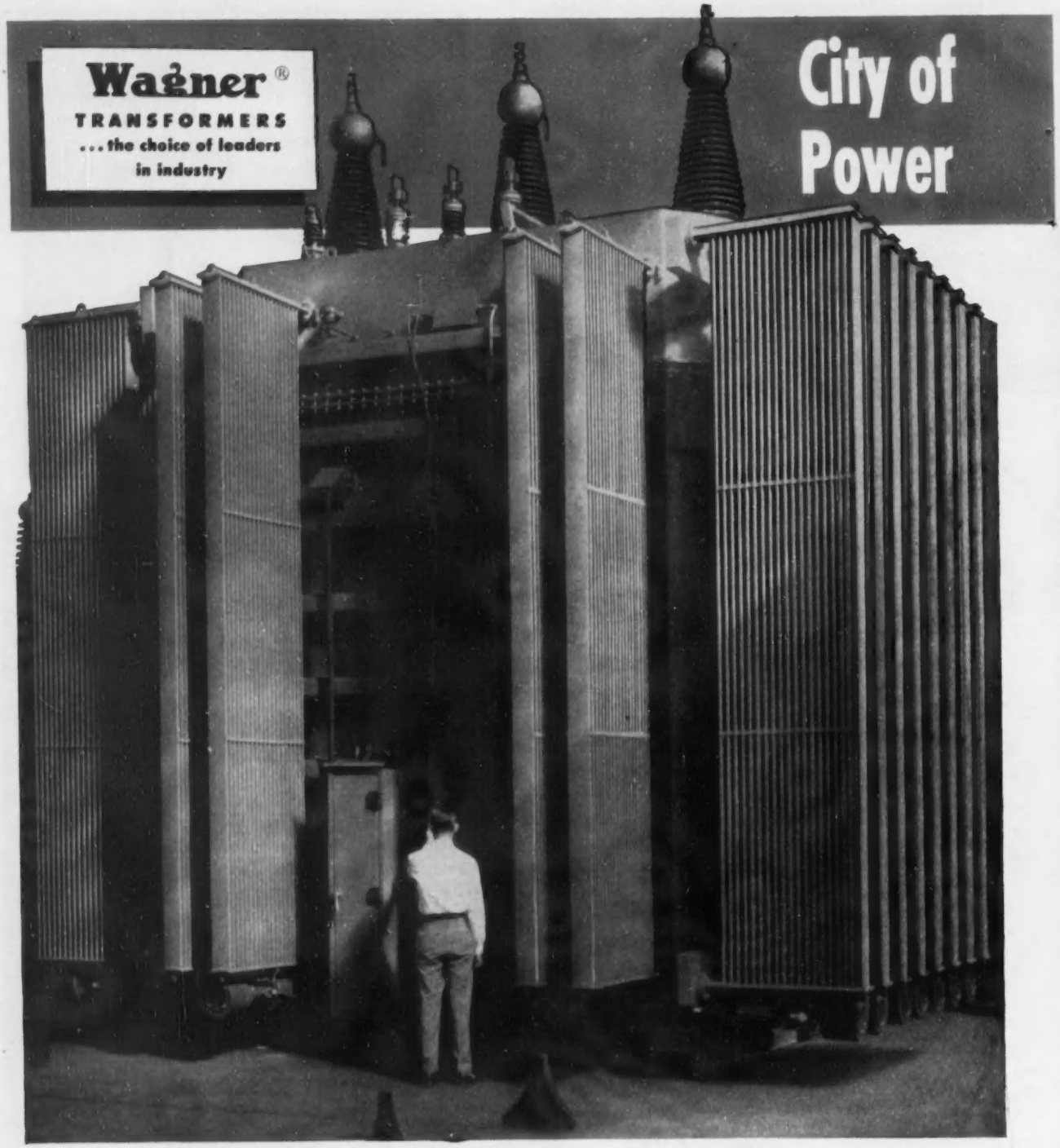
Now note how the THOMAS DIVERTER skirt (illustrated at the right above) eliminates impact. This DIVERTER skirt (Patent applied for) is simply a heavy corrugation designed with a contour that *diverts* the lower insulator or fittings away from any petticoats.

No matter how roughly the insulators are handled, when the cap is pulled off the ball pin, it will first strike the DIVERTER which it cannot break. This glancing blow will deflect any destructive IMPACT from the lighter petticoats. Simple . . . but EFFECTIVE.

All standard Thomas 10-inch suspension insulators now have this feature . . . at no extra cost.

Specify THOMAS INSULATORS—THE BEST BY LINE TEST

The R. Thomas and Sons Company is a manufacturer and designer of all types of porcelain insulators . . . pin-type, switch, suspension, spools, guy-strain, bushings and special high-voltage porcelain. In addition, Thomas supplies associated line hardware, clamps, fittings, and so on.



This Wagner Power Transformer is one of two installed in Tacoma, Washington. Each is rated 30,000/37,500/50,000 kva, class OA/FA/FA three-phase, 60 cycle, 105000Y to 13,800 volts.

Wagner Electric Corporation
EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

T54-4

Tacoma installs two new Wagner Transformers to supply growing loads

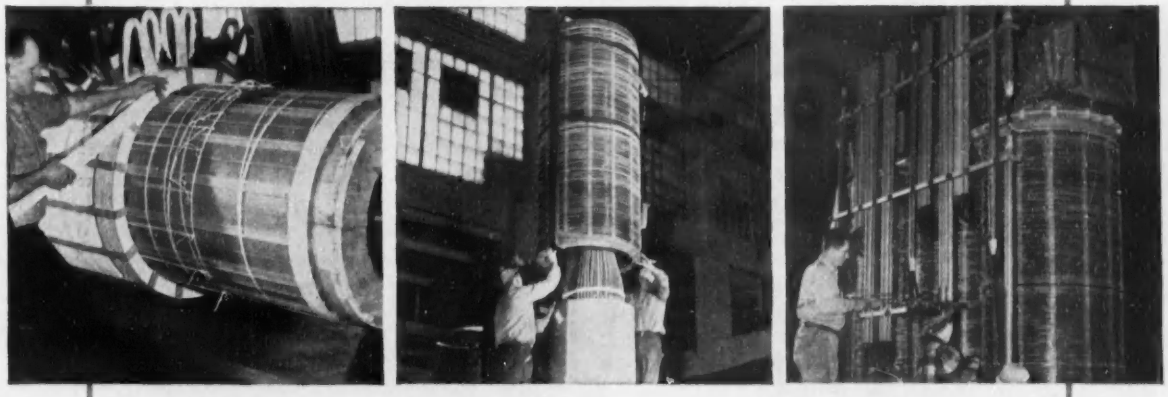
The Tacoma, Washington, Department of Public Utilities has recently installed two new Wagner Power Transformers each rated 30,000/37,500/50,000 kva, class OA/FA/FA, as part of an expansion program to help supply its constantly growing power load.

Wagner Transformers were chosen by the City of Tacoma, as they are by many power companies, because of their reputation for adequate and reliable service.

Wagner has been building power transformers for more than sixty years. The knowledge gained and the facilities acquired in all those years make the building of fine power transformers part of the day's work at Wagner.

Years of engineering "know-how"—Wagner's insistence on the use of only the highest quality materials—carefully controlled production methods—rigid inspections and tests all combine to assure users power transformers that will provide utmost reliability and service continuity.

Wagner's newly increased facilities now permit the manufacture of power transformers in ratings to meet your needs. It will pay you to consult Wagner on your next power transformer installation.



Every step in the construction of Wagner Power Transformers receives special attention. Three operations are shown above. Highly skilled workers wind a low voltage coil, carefully place a high voltage stack into position, and make the final connections on a core and coil assembly.

Thirty-two branch offices, located in principal cities, are at your service. Bulletins TU-180 and TU-181 give information on the complete line of dependable Wagner Transformers.

WAGNER ELECTRIC CORPORATION

6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

BRANCHES IN 32 PRINCIPAL CITIES

Duo-Guard Pushmatic . . . Now the STANDARD

Only Duo-Guard provides

→ **1. FOR BRANCH CIRCUITS**

→ **2. FOR LAMP and APPLIANCE CORDS**

Duo-Guard Pushmatic circuit breakers give you double protection because they have separate thermal and magnetic elements. The Duo-Guard principle assures you that lamp and appliance cords, as well as branch circuits, are guarded from thermal and electrical faults.

No other breaker—at any price—has both:

Thermal Element (bimetal strip) protects branch circuit wiring and insulation, from Electri-Center panelboard to receptacle or outlet, from any kind of thermal overloads . . . and prevents nuisance tripping.

Magnetic Element (multiple-turn solenoid) provides instantaneous protection for lamp and appliance cords, from receptacles or outlets to all properly connected electrical equipment. Also protects branch circuit wiring.

Now the standard BullDog breaker, Duo-Guard Pushmatic has all the famous BullDog exclusive features: simple-to-operate push-button control; day or night identification of "OFF" breaker; bolt-tight installation. No other breaker offers as much . . . yet many cost more.

Get the complete story on the world's most efficient circuit breaker. Write, today, for new, free Bulletin PM-365. BullDog Electric Products Company, Dept. WD-14, Detroit 32, Michigan.

©BEPCO

Why Duo-Guard Pushmatics Provide Double Protection

THOROUGHBRED IN ELECTRICAL EQUIPMENT

BULLDOG

BullDog Breaker

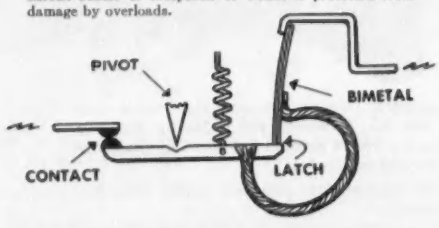
double protection

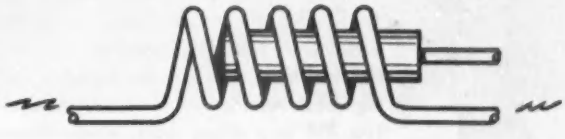
DUO-GUARD

Duo-Guard Pushmatics are available in 15-, 20-, 30-, 40- and 50-ampere ratings: 1-pole, 120 V., A.C.. Listed by Underwriters' Laboratories, Inc.

Simplified diagram of Thermal Element

As bimetal is heated by excess electric current, it bends and releases latch. Spring snaps latch upward, breaking contact. Branch circuit wiring, including insulation, from Electri-Center to receptacle or outlet is protected from damage by overloads.

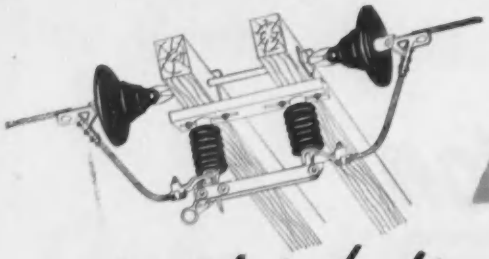




Simplified diagram of Magnetic Element

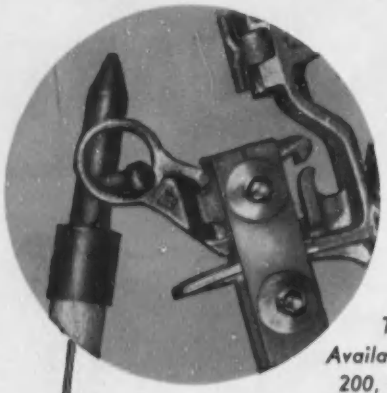
Wound wire coil (solenoid) is energized by current. When short occurs, coil *instantly* activates metal plunger which breaks contact. BOTH BRANCH CIRCUIT WIRING AND LAMP AND APPLIANCE CORDS ARE PROTECTED FROM ELECTRICAL OVERLOADS AND SHORTS.

ELECTRIC PRODUCTS COMPANY



Extras Count

in Distribution Line Switch Design!

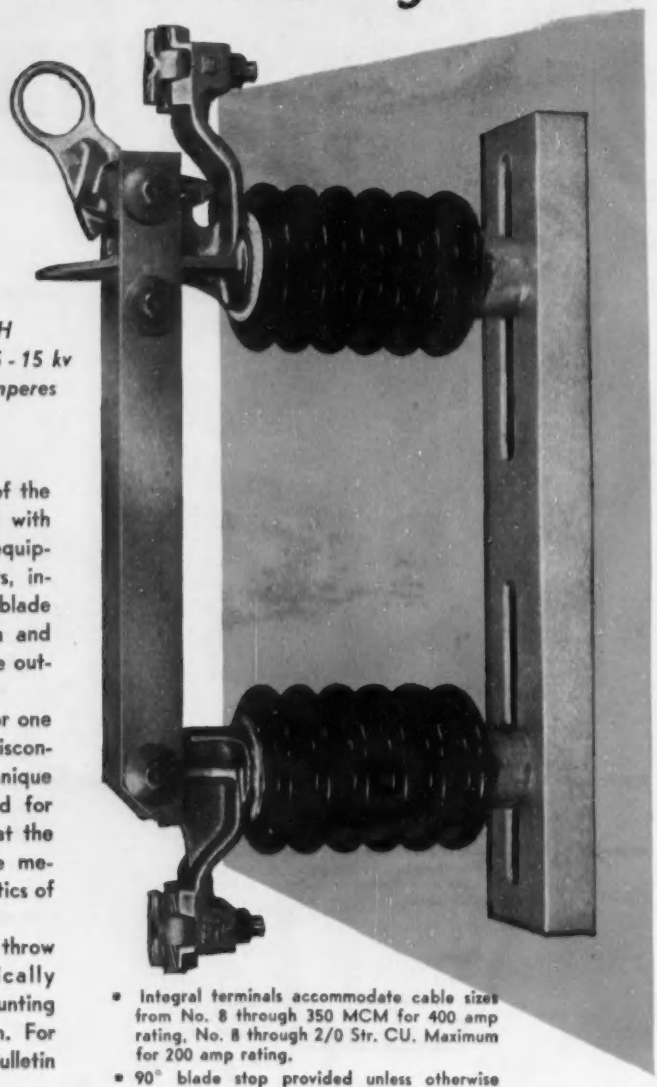


Type PH
Available 7.5 - 15 kv
200, 400 amperes

The Type PH incorporates many of the design "extras" usually associated with much more expensive switching equipment. High Pressure line contacts, integral terminals, rugged parallel blade construction, blade pry-out action and positive latching are a few of these outstanding features.

The PH was specifically tailored for one job . . . isolating, by-passing or disconnecting on distribution lines. It is unique in that it may be easily justified for application on low revenue lines at the same time affording most of the mechanical and operating characteristics of high cost switches.

The PH is a single pole, single throw hookstick-operated switch specifically designed for wood cross arm mounting in vertical or underhung position. For further information write for Bulletin 53 PH.



- Integral terminals accommodate cable sizes from No. 8 through 350 MCM for 400 amp rating, No. 8 through 2/0 Str. CU. Maximum for 200 amp rating.
- 90° blade stop provided unless otherwise specified.

Southern States Equipment Corp.
HAMPTON GEORGIA

WEATHERPROOF LINE WIRE

The section of Duraline has been photographed with covering unsaturated to show construction.

SERVICE DEPENDABILITY

Duraline, like a rosebud, keeps moisture out

Duraline's unique construction — an exclusive continuous interlocked fibrous sheath, thoroughly impregnated with URC saturants, then covered with URC finishers—provides finest weatherproof performance and service dependability. Won't festoon, stays right there on the job. Provides added protection against contact with foreign objects.

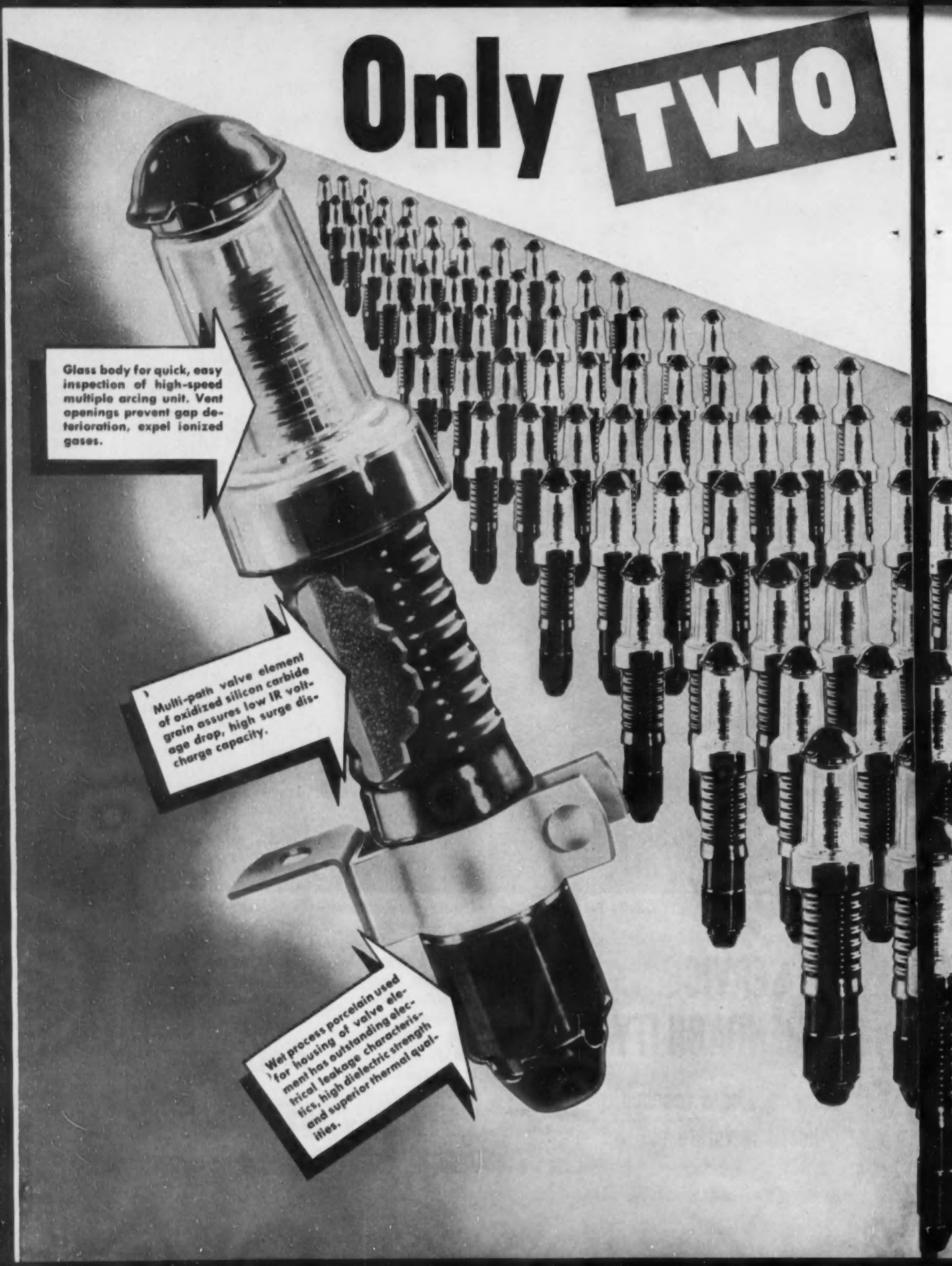
Duraline* is your best insurance against bad weather. Only Anaconda makes a line wire like this. Available with copper, Copperweld or aluminum conductors. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.* 53326

*Reg. U. S. Pat. Off.

ANACONDA®

service and overhead distribution cables, both bare and weatherproof, including ACSR • signal, control and communication wire • portable cords and cables • network cables • airport and street lighting cables • mine cables • magnet wire • copper, aluminum, and copperweld conductors • wire and cable accessories.

Only TWO


Glass body for quick, easy inspection of high-speed multiple arcing unit. Vent openings prevent gap deterioration, expel ionized gases.
Multi-path valve element of oxidized silicon carbide grain assures low IR voltage drop, high surge discharge capacity.
Wet process porcelain used for housing of valve element has outstanding electrical leakage characteristics, high dielectric strength and superior thermal qualities.

in 500,000

LIGHTNING ARRESTER YEARS

ONLY TWO FAILURES MAR PERFECT RECORD OF TIME-PROVED DEPENDABILITY

Throughout 500,000 lightning arrester years, only two Crystal Valve Ventilated Gap Lightning Arresters have ever failed. Thousands upon thousands have given year after year of trouble-free protection, under every operating condition, all over the world.

First introduced in 1936, this time-tested arrester has never required any major change in design. Today, as then, gap ventilation assures freedom from gap corrosion . . . interior is always clean and dry. Vents expel conductive ionized gases, bring in fresh air for high resistance to circuit current.

The same "Ultra-speed" gap is still service-engineered to be the fastest gap in the industry. The same oxidized silicon carbide grain provides a multi-path valve element for quick uniform distribution of surge discharge and fast suppression of follow current.

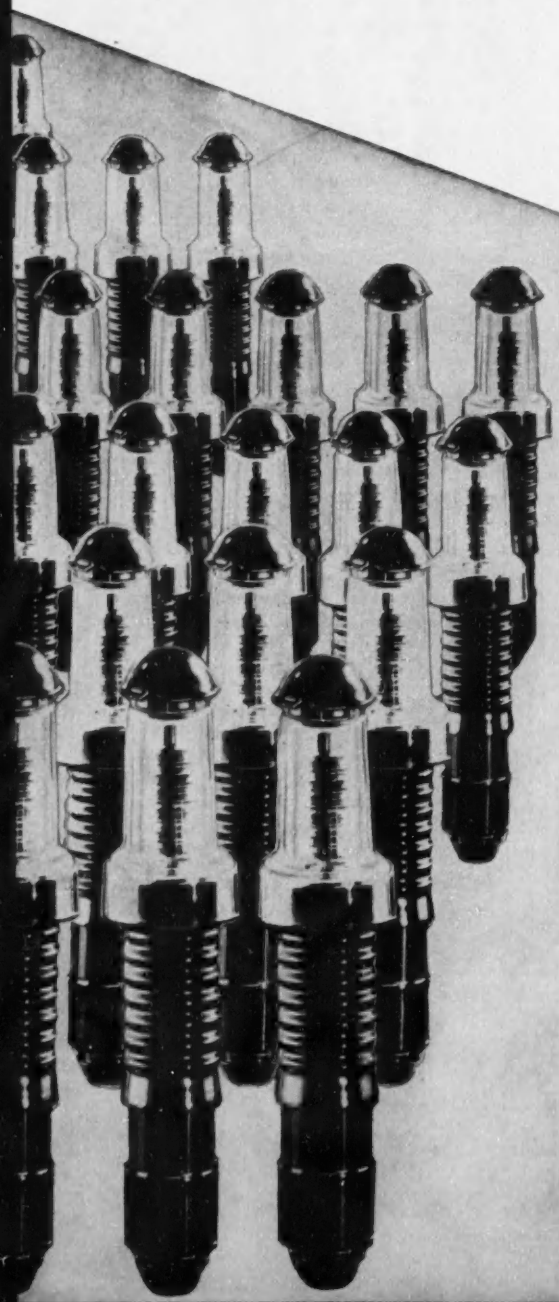
Crystal Valves combine every modern scientific advancement with the time-proved reliability of the vented gap. For dependable protection, under every weather and lightning condition, install Crystal Valve Ventilated Gap Arresters on every transformer.

Write today for illustrated folder with full details

ELECTRIC SERVICE MANUFACTURING CO.

PHILADELPHIA 32, PA.

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto



CRYSTAL VALVE

Ventilated Gap LIGHTNING ARRESTERS

Service Engineered by ELECTRIC SERVICE

BIDDLE
Instrument News

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

JAMES G. BIDDLE CO., 1316 ARCH ST., PHILADELPHIA 7, PA.

USE OF THE "TTR" TRANSFORMER TURN RATIO TEST SET ON INDIANAPOLIS POWER AND LIGHT COMPANY SYSTEM

N. J. Galuppo, Transformer Engineer

We have found greatest application for the Biddle "TTR" Set on power transformer regulators. This instrument is so simple to operate that any workman, doing maintenance work on transformers, can be relied on to make accurate checks after a few explanatory measurements on a simple transformer which is in good condition.

There have been several instances recently where, after repairs on both no-load and under-load tap changers, we have found the "TTR" very reliable in checking proper sequence of the tap range, before placing the transformer or regulator back in service.

Courtesy Indianapolis Power & Light

In cases where both H. V. and L. V. bushings are brought through wall bushings into cable compartments, we find the "TTR" particularly advantageous. By lowering the oil in the unit, a man can safely make ratio and polarity checks while inside the transformer without any danger of using an unsafe voltage.

Routine checks on new power transformers and regulators include ratio and polarity checks as indicated by the "TTR".

After any repairs are made on used equipment, it must be checked by the "TTR" before it is placed back in service. This instrument is used to test ratio and polarity on single-phase and 3-phase transformers, 5 kva to 83,500 kva inclusive.

The "TTR" operates on the principle that, under no burden, the terminal voltage ratio of a transformer is almost exactly equal to its turn ratio. When two transformers are connected in parallel and excited, there will be a circulating current between their secondaries unless the turn ratios of the two transformers are identical.

The photograph above shows the "TTR" Set being used to check ratio and polarity on a new transformer with under-load tap changers, previous to placing in service.

Write for BULLETIN 55-W

New Dolly, available as an accessory with both Models 4 and 5 Biddle Impulse Cable Fault Locating Transmitters

Announcing...

A 5 KV MODEL BIDDLE IMPULSE CABLE FAULT LOCATING TRANSMITTER

Model 5, 5 KV, 16 MUF

A new Transmitter, known as Model 5, has just been made available to those in the industrial field who operate an appreciable amount of 600 volt cable in their manufacturing processes. Manufacturers who operate cable in the 2500 volt delta and 4000 volt wye insulation class will also find this Transmitter well suited to their needs for proof testing and locating faults on important circuits. Similar applications include the proof testing and location of faults in drag cables such as used with electric shovels in strip mines. Other applications include extensive lighting circuits such as used at airports and in highway lighting.

Faults on low voltage cable of the rubber insulated, unarmored type can often be located by the impulse method by simply walking along the cable run and listening for the noise of the discharge. This applies to the ordinary kinds of installations such as metallic conduit or duct construction, open wiring, drag cables, and those buried directly in the earth. Since low voltage circuits are short in length as compared to high voltage installations, listening for the noise of the discharge is usually more practical than using the Biddle Detector to trace the signal. On such installations it is more economical to obtain the Model 5 Transmitter only, without the Detector which is so necessary in the case of high voltage installations.

Write for BULLETIN 65-W B-401

JAMES G. BIDDLE CO.

Electrical & Scientific Instruments • 1316 Arch Street • Philadelphia 7, Pennsylvania

MEGGER INSULATION RESISTANCE TESTERS

DUCTER LOW RESISTANCE OHMMETER

MEG-TYPE MEGGER INSULATION TESTER

MIDGET MEGGER CIRCUIT TESTING OHMMETER

BIDDLE IMPULSE CABLE FAULT LOCATOR

MEGGER LOW RESISTANCE OHMMETER

"TTR" TRANSFORMER TURN RATIO TEST SET

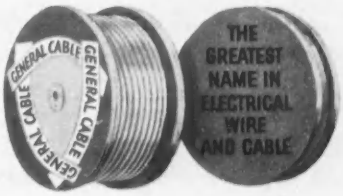
GENERAL CABLE

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

To wire a plant or wind a coil

IT PAYS TO BUY IN ONE PLACE!

Actually there is only one source for all of the types of wire and cable you may need...that's General Cable. To meet your every requirement, General Cable manufactures bare, weatherproof and insulated conductors of every variety ...maintains vast stocks...the broadest distribution facilities in the industry...ultra-modern plants coast to coast. Specify "General Cable." Don't settle for less.



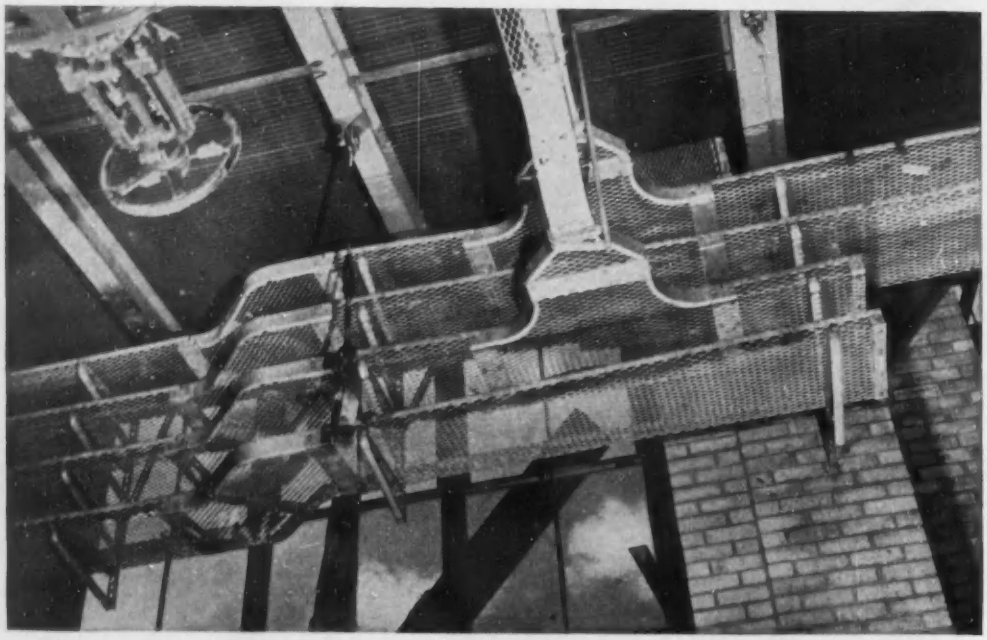
GENERAL CABLE CORPORATION 420 Lexington Avenue, New York 17, New York

Sales Offices: Atlanta • Buffalo • Cambridge (Mass.) • Chicago • Cincinnati • Cleveland • Dallas • Detroit Houston • Indianapolis • Kansas City • Los Angeles • Milwaukee • Minneapolis • Newark (N. J.) • New York • Philadelphia Pittsburgh • Portland (Ore.) • St. Louis • San Francisco • Seattle • Syracuse • Tulsa • Washington, D. C.

T. J. COPE, INC.

711 SOUTH 50TH STREET, PHILADELPHIA 43, PA.

Standard systems of trough and fittings for supporting power and control cable.
— For over 65 years, Manufacturers of Tools and Equipment for
Installation of Underground and Overhead Electric Cables



Cope Cable Trough installed at Jersey Central Power and Light Company, E. H. Werner Station, South Amboy, New Jersey, Burns and Roe, Engineers and Constructors; Hatzel and Buehler, Electrical Contractors.

The Cope Standardized System of Cable Trough offers a simple, sturdy, time and labor saving construction for the support of electrical power and control cable. It is widely accepted by leading engineers and contractors as is indicated by an impressive list of outstanding installations.

Practically any layout problem can be met. Sturdy raceways of varying widths, at different levels and in any direction are easily installed. They can pass around, over or under obstructions and change from one size trough to another. For very unusual conditions, special fittings can be designed and fabricated.

Standard straight trough is in 8′ lengths and in 6″, 12″, 18″, and 24″ widths. All are 3″ high including steel binding strip. Covers are also available. Assembly requires only the use of nuts and bolts which are supplied. All parts are hot dip galvanized. Write for Bulletin 65A for full details.

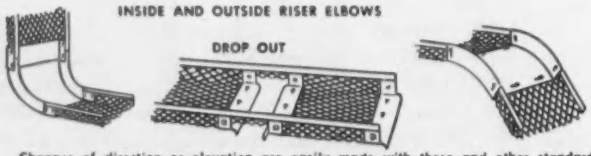
COPE STANDARD FITTINGS

. . . in the Horizontal Plane

TEE ELBOW REDUCER

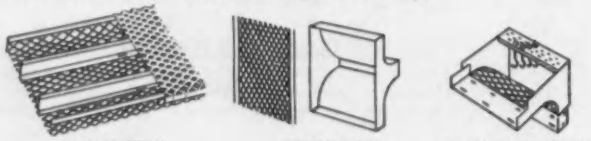
All fittings have radius corners to protect the cable from damage during installation and insure a neat finished job.

. . . in the Vertical Plane



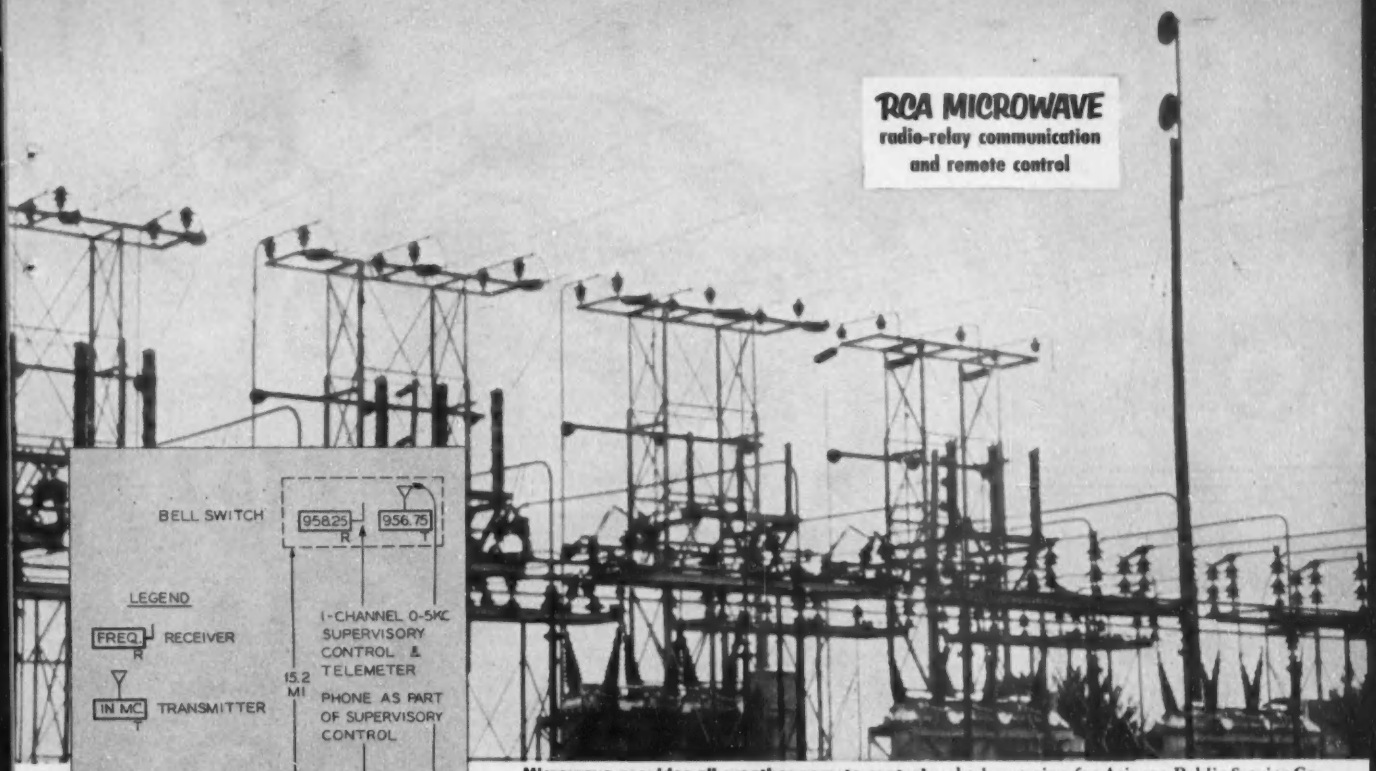
Changes of direction or elevation are easily made with these and other standard fittings shown in Bulletin 65A. Write for it.

. . . Barrier Strips and Miscellaneous Fittings

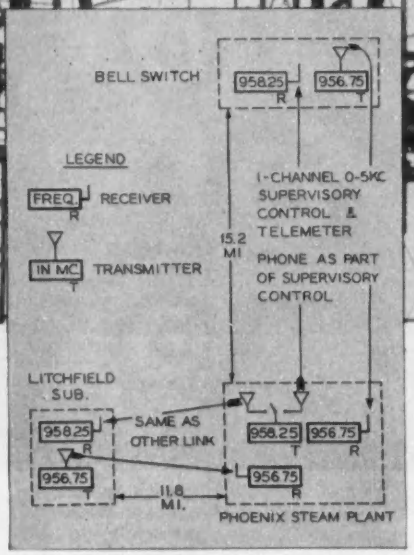


BARRIER STRIP VERTICAL TEE CABLE SUPPORTING RISER ELBOW

RCA MICROWAVE
radio-relay communication and remote control



Microwave provides all-weather remote control and telemetering for Arizona Public Service Co. Unattended substations receive control impulses from steam plant at Phoenix



Arizona Public Service Co. 960-mc Microwave system. Selector switch connects transmitter to either antenna at Phoenix steam plant

Through severest heat, sand, electric storms ... Arizona Public Service Company's remote supervisory control system (via Microwave) stays on the job

Since 1949 Arizona Public Service Company has used RCA Microwave for remote supervisory control of two substations from a steam-electric plant. One installation provides remote control and indications on five 69-kv breakers, telemetering of voltage and current, and a 2-way voice channel. The other installation controls two breakers and provides telemetering and voice channels between plant and switching station. (*See schematic.*)

Four years of operation under trying conditions have proved the reliability of RCA Microwave. Through ambient 140-degree heat, high winds, severe sand and dust storms, violent rain and electric storms—Public Service's supervisory control system stayed on the job. Here was a link which was independent of the transmission lines it services . . . providing reliable communications and control when needed most.

MANY ENGINEERING ADVANTAGES

Sound engineering features led Public Service to select microwave rather than high-line carrier. Microwave offered good noise and distortion characteristics, easy tie-in with mobile radio, greater channel capacity, reasonable freedom from interference, and relative ease of maintenance.

The economy factor also favored RCA Microwave. While a one-channel microwave system generally costs more than carrier to install, *in this particular case* it cost $9,000 less because crowded carrier frequency space would require considerable new equipment. In addition, RCA Microwave's built-in provisions for extra channels make it the *least expensive form of communication per channel mile.*

A PRACTICAL SYSTEM

Outage time of RCA Microwave is next to zero. "Dish" antennas beam highly directional radio signals from one relay station to the next. The radio transmissions follow a line-of-sight path—can approximately parallel power lines. Equipment uses easy-to-service familiar circuits and readily available tubes. It can interconnect with existing telephone lines, switchboards and mobile radio installations. One RCA Microwave system will handle up to 25 voice channels (or 25 x 18 telemetering and control channels).

You can prepare now for your expanding communications needs, *before they develop.* The booklets listed below provide quickly digested facts to help with future planning. *Mail the coupon—there's no obligation on your part.* And remember, the RCA Service Company provides nation-wide installation and service facilities.

RADIO CORPORATION of AMERICA
COMMUNICATIONS EQUIPMENT CAMDEN, N. J.

Dept AC-45, Building 15-1

Without obligation on my part, please send me your *free* booklet on: ☐ Microwave for Telemetering and Supervisory Control ☐ Electric Utility Microwave Systems

Name_____ Title_____

Company_____ Address_____

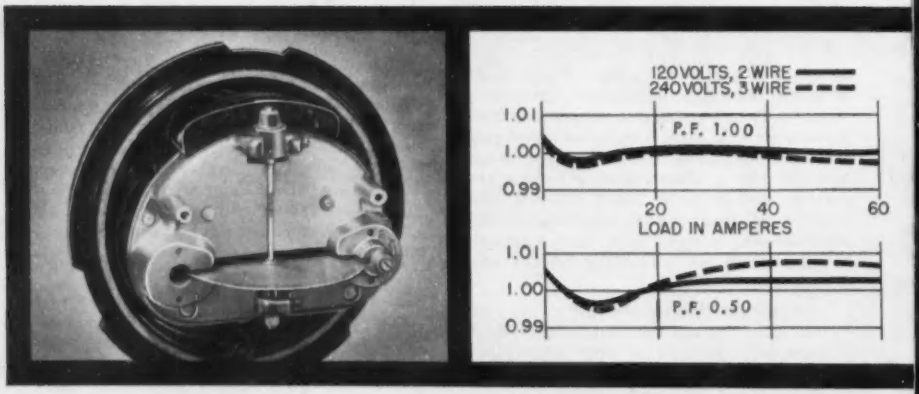
City_____ Zone_____ State_____

☐ Have an RCA communications specialist get in touch with me

NEW

General Electric Type I-50 universal 2-wire / 3-wire watthour meter

NEWEST MEMBER of the General Electric I-50 family, the universal I-50 meter is two-meters-in-one, both 2-wire and 3-wire. It can be quickly converted *in the field* from 120-volt to 240-volt service with only a screwdriver. Total conversion time: about *one minute.*



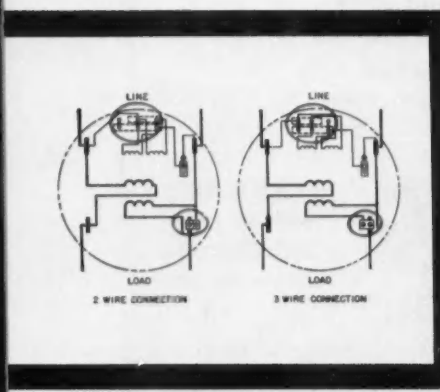
3 **IMPROVED DESIGN** of the new universal I-50 watthour meter permits conversion with a minimum change in calibration; normally eliminates any need for recalibration.

4 **STRAIGHT-LINE ACCURACY** up to 60 amperes for both 120- and 240-volt service results in longer meter life and lower maintenance costs.

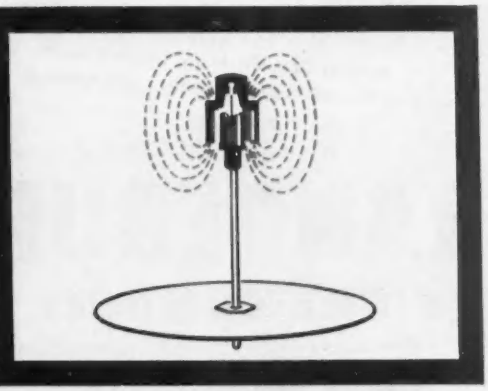
✻ **GENERAL ELECTRIC TYPE I-50 UNIVERSAL 2-WIRE/3-WIRE WATTHOUR METER** is the newest member of the I-50 family. For a sample demonstration, or for more information, contact your nearest G-E representative, or write: Section 601-102, General Electric, Schenectady 5, New York.

Another new member of the I-50 family

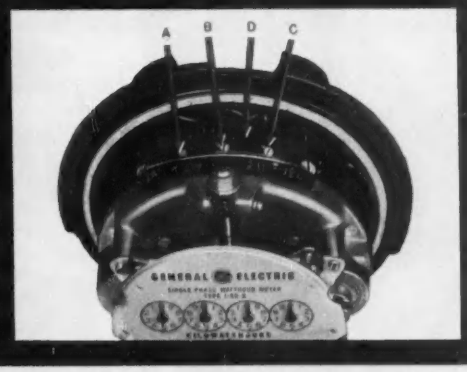
5 REASONS WHY THIS NEW G-E METER* WILL LOWER YOUR METERING COSTS

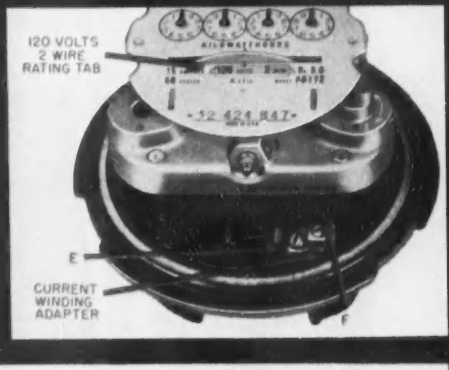


1 **NEW UNIVERSAL** I-50 meter, shown connected for 2- and 3-wire operation, incorporates many cost-saving features of the 15-amp I-50.



2 **MAGNETIC SUSPENSION SYSTEM,** with the "floating disc," inherent high accuracy, co-ordinated insulation all mean lower maintenance and operating costs.





5 **CONVERT IN A MINUTE.** Here's how conversion is done in the field from 2- to 3-wire with only a screwdriver, quickly and easily: **POTENTIAL-CIRCUIT** conversion: Snap off terminal-board cover; loosen screws A, B, C and move terminal board D from position BC to position AB; tighten screws A, B, C; replace cover. **CURRENT-CIRCUIT** conversion: Loosen two screws on current winding adapter; swing connector from position E to F; tighten screws; remove rating tab.

GENERAL ELECTRIC

SPECIFICATION SHEET

THESE ARE THE REASONS FOR SPECIFYING ORANGEBURG FIBRE CONDUIT:

- ★ Lasts indefinitely.
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- ★ Easy to tool on the job.
- ★ Tough and resilient — it does not crack or break when properly handled.
- ★ Orangeburg is a leader in every city and state.

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STANDARD INSTALLED WITH CONCRETE ENCASEMENT

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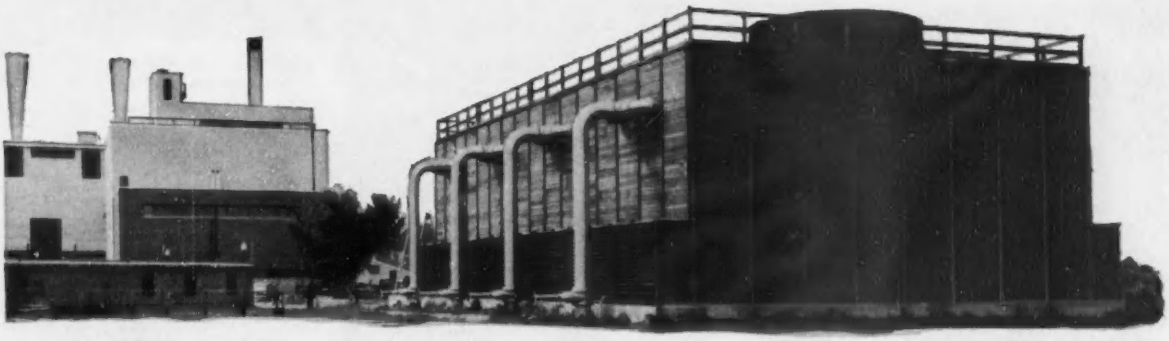
GraybaR ELECTRIC COMPANY



MODERN PLANTS NEED PRITCHARD!

The Pritchard Heavy Duty Cooling Tower pictured here was designed and constructed for the St. Joseph Light & Power Co., St. Joseph, Missouri. This mechanical draft tower has the capacity to cool water from 115° F down to 95° F at the rate of 21,400 gallons per minute. The amount of water conserved for re-use by this Pritchard tower amounts to about *twice* the total rate of water consumption for the entire city of St. Joseph.

Such dependable performance and vital water conservation is Pritchard's answer to industry's demand for modern, efficient cooling tower operation. Pritchard's long experience and constant research produce towers that are designed *right* . . . engineered with adequate capacity . . . to do any required cooling job. Exclusive design features and rugged long-life construction assure top value . . . both in first cost *and* operating costs.

Farsighted industrial leaders—like the officials of the St. Joseph Light & Power Company—are giving top priority to modernization plans for conserving water and improving plant efficiency. That goal is the reason so many of these men depend on Pritchard—a founder member of the Cooling Tower Institute. They know that whether modernizing or expanding they can depend on the *guaranteed performance* of a Pritchard Heavy Duty Cooling Tower.

Whatever your cooling tower need, solve it easily by contacting your nearest Pritchard representative listed in the classified section of your telephone directory or write direct to Pritchard's General Offices, Kansas City, Mo.

Pritchard QUINTAIR* Air-Cooled Heat Exchangers

This quality Pritchard unit guarantees modern cooling efficiency . . . provides low-cost, dependable cooling of engine jacket water or lubricating oil; condensing and cooling of hydrocarbons and steam; money-saving operation in other process cooling service. A single unit may be used for two or more simultaneous cooling jobs. Long, trouble-free service is assured by quality Pritchard construction. Practical Pritchard design makes all parts that may require attention readily accessible for quick, easy inspection and maintenance. Completely fabricated . . . shipped ready for fast, easy installation.

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First-Class Covering for Aluminum Conductors

The characteristics that have made BAKELITE *Polyethylene* an excellent covering for copper conductors can be applied with equal advantage to aluminum. Its weight-saving and cost-cutting features are particularly effective in such applications as line wire and service drop cable.

A covering of BAKELITE *Polyethylene* provides several outstanding benefits. It stays tough and flexible at −70 deg. C., resists deformation at temperatures in the neighborhood of 90 deg. C. Its excellent mechanical and electrical properties permit smaller diameters, making handling easier. The waxy surface and light weight aid in pulling and stripping. BAKELITE *Polyethylene* resists oil, grease, alkalies, most strong acids, abrasion, and mildew. Service life is long—tests with the black compound indicate a service life of several decades. It won't festoon.

Now is the time for you to study the potentialities of BAKELITE *Polyethylene* for wire and cable construction. As a start, send for KABELITEMS No. 68, which contains data on abrasion tests. Write Dept. TL-63.

Outstanding Electrical Properties (black compound) for signal systems and service drop, wet or dry—at 25 deg. C., power factor is only 0.004; dielectric constant is 2.5. These electrical properties remain constant through a frequency range from 60 cycles to 50 megacycles. Operating temperatures in the neighborhood of 90 deg. C. have little effect on electrical properties. Volume resistivity is so high that it can be measured only by extremely sensitive instruments. BAKELITE *Polyethylene* excels in resistance to voltage breakdown, even after long-continued water immersion.

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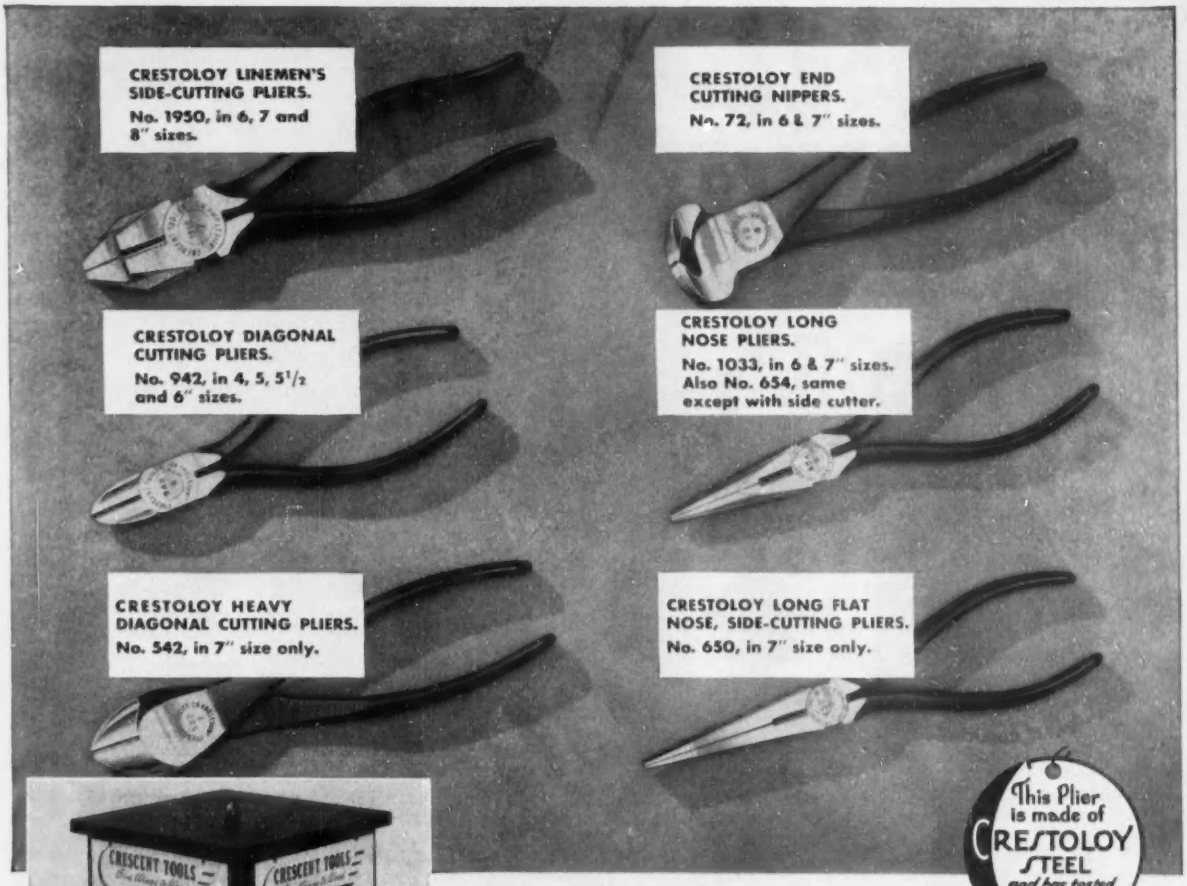
In Canada: Bakelite Company, A Division of Union Carbide Canada Limited, Belleville, Ontario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Your hardware dealer carries a wide selection of Crescent and Crestoloy Tools. You cannot buy finer tools at any price.

CRESCENT TOOLS
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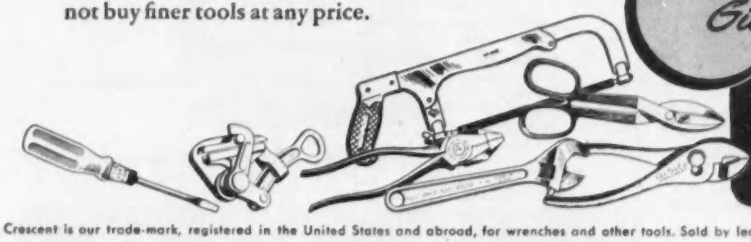

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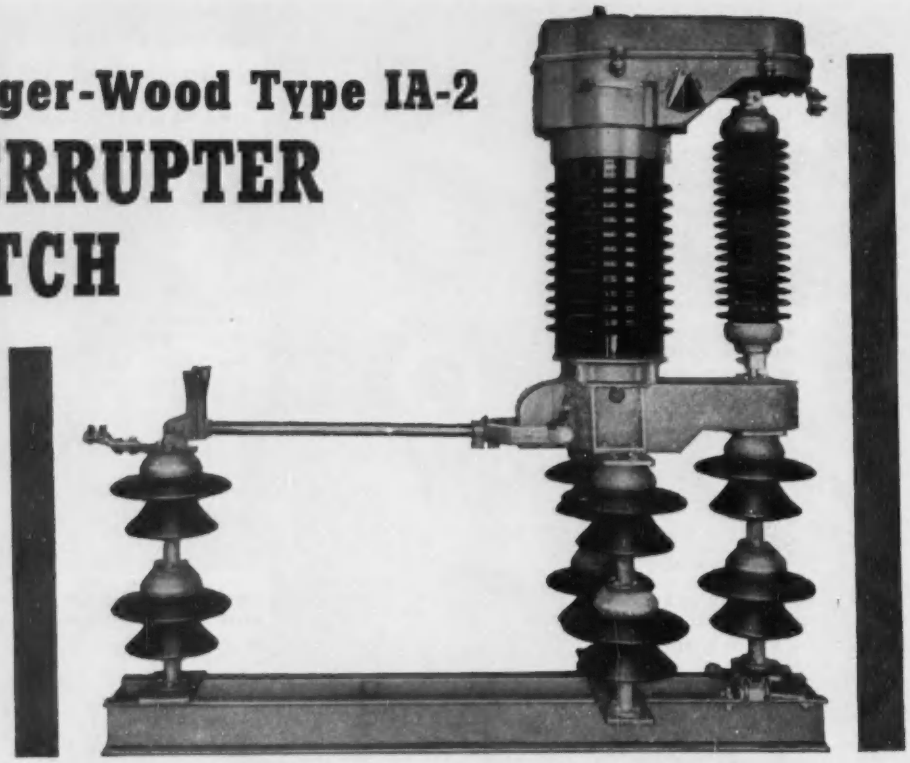
Schwager-Wood Type IA-2
INTERRUPTER SWITCH



Single Pole 69 KV-250 MVA shown above. The switch is available in ratings from 34.5 KV to 115 KV. The 115 KV Interrupter Switch is also available in an interrupting rating of 500 MVA.

The Schwager-Wood Interrupter Switch offers real economies in switching and protection of transformer banks, and in the dropping of long line charging currents. This switch also gives protection against faults within the range of its interrupting rating.

Low original cost, minimum installation and maintenance expense have proved this Interrupter Switch to be a money-saving investment.

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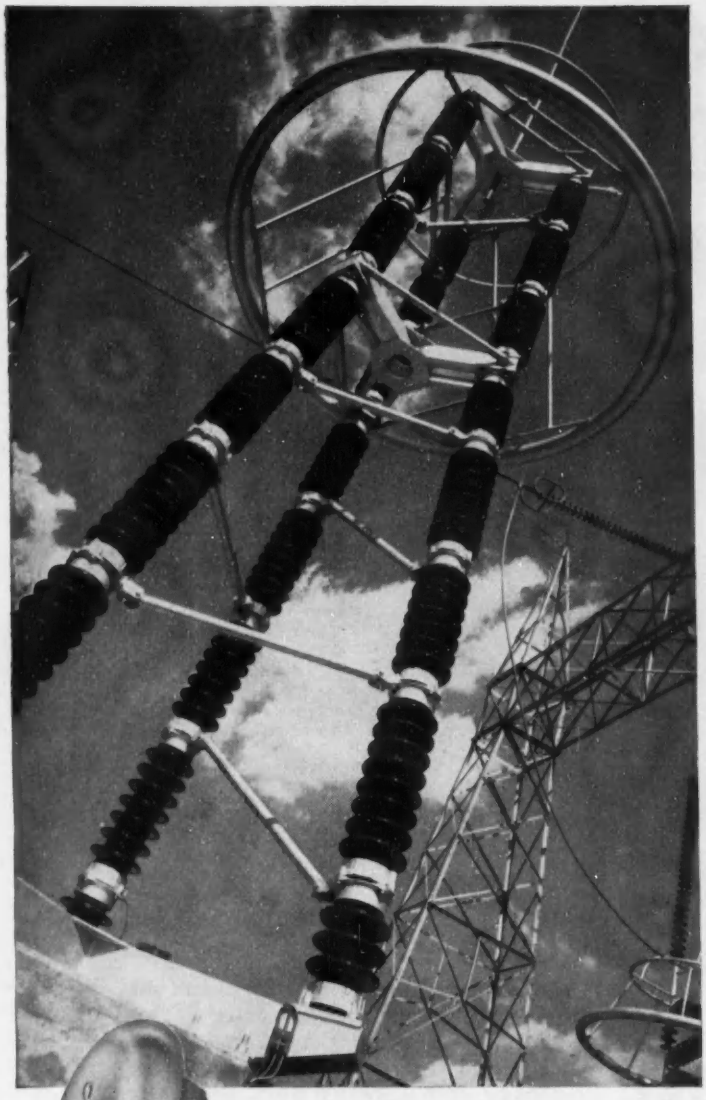

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THIS NEW Roebling ROEPLASTIC Control Cable makes circuit identification quick and certain for the first time in history. A workman can't go wrong even if he's color blind. Here's why:

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Roebling ROEPLASTIC Control and Signal Cables are ideal for such purposes as remote control of motors, switch gear, automatic machinery, etc.... for traffic light control, relay, metering and supervisory circuits. They are made in constructions, types of insulations and over-all sheaths to meet every specific requirement. Write for technical data... and order ROEPLASTIC Control and Signal Cables from your Roebling distributor. John A. Roebling's Sons Corporation, Trenton 2, N. J.

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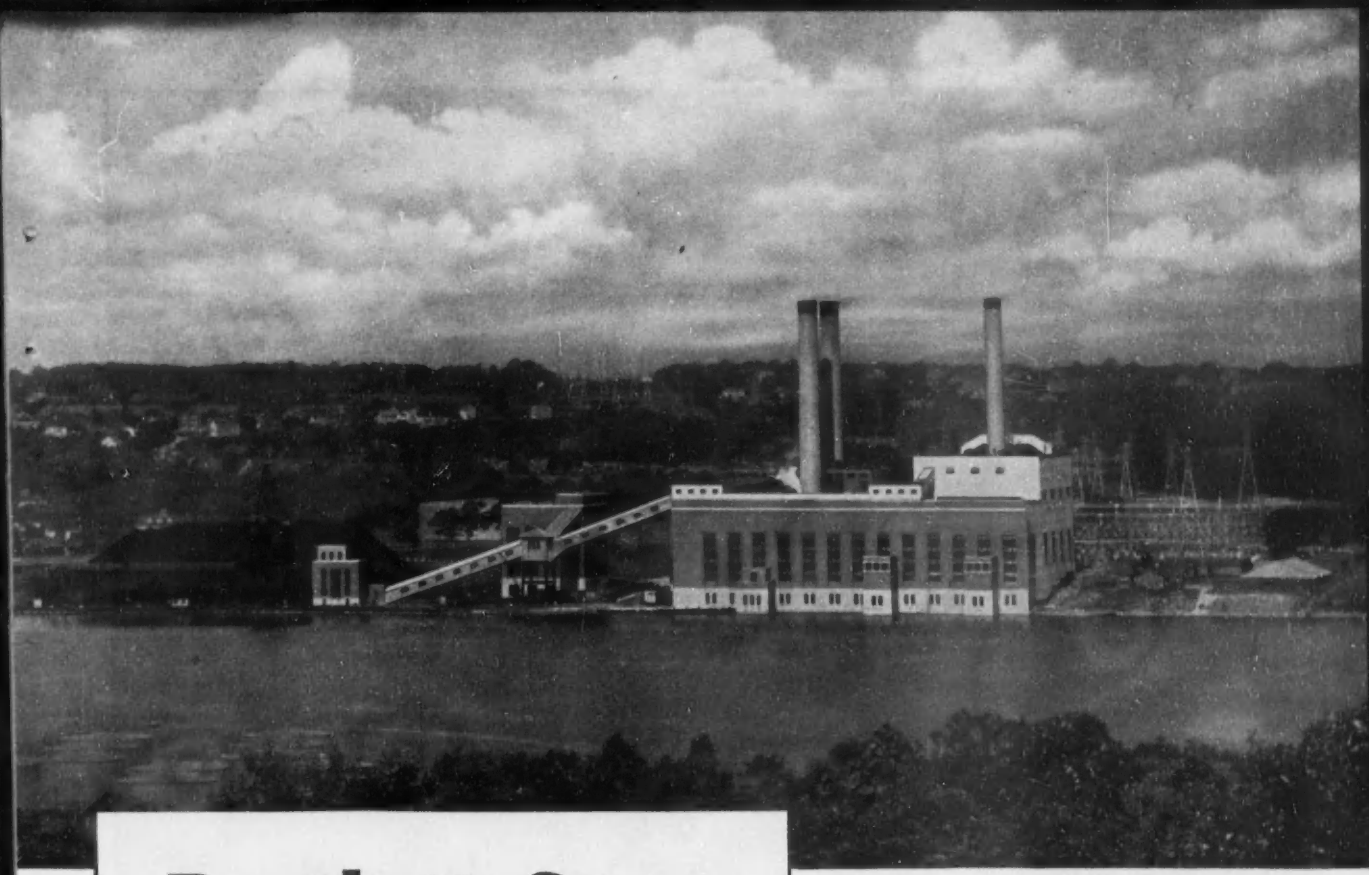
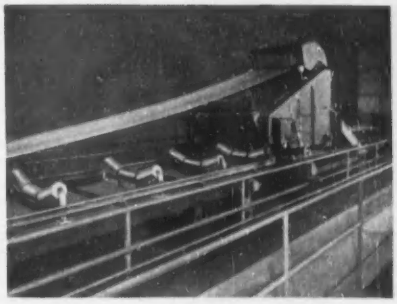


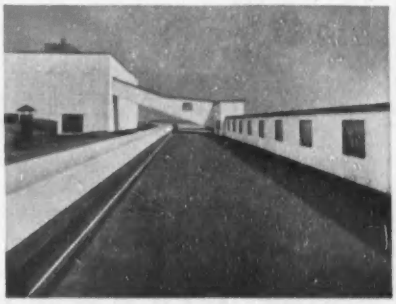
General View of Somerset Station
Montaup Electric Company
Stone and Webster Engineering Corp.
Consulting Engineers

Bartlett-Snow coal handling at Montaup

● The illustration above shows the Montaup Electric Company's Somerset Station after completion of a 60,000 K.W. extension that increased the total capacity of the plant to 210,000 K.W. The new coal handling equipment required — built and installed by Bartlett-Snow to Stone and Webster specifications — includes conveyors, weightometer and tripper. It connects into the old system at the south end of the plant, and is carried through a gallery built on the roof to discharge coal into the new bunker at the north end of the plant. For new plant projects, modernization programs, and additions and extensions to existing facilities, call the Bartlett-Snow coal handling engineers.



Bartlett-Snow Belt Conveyor Tripper
Over New Bunker



View of New Belt Conveyor Gallery
Built on Roof

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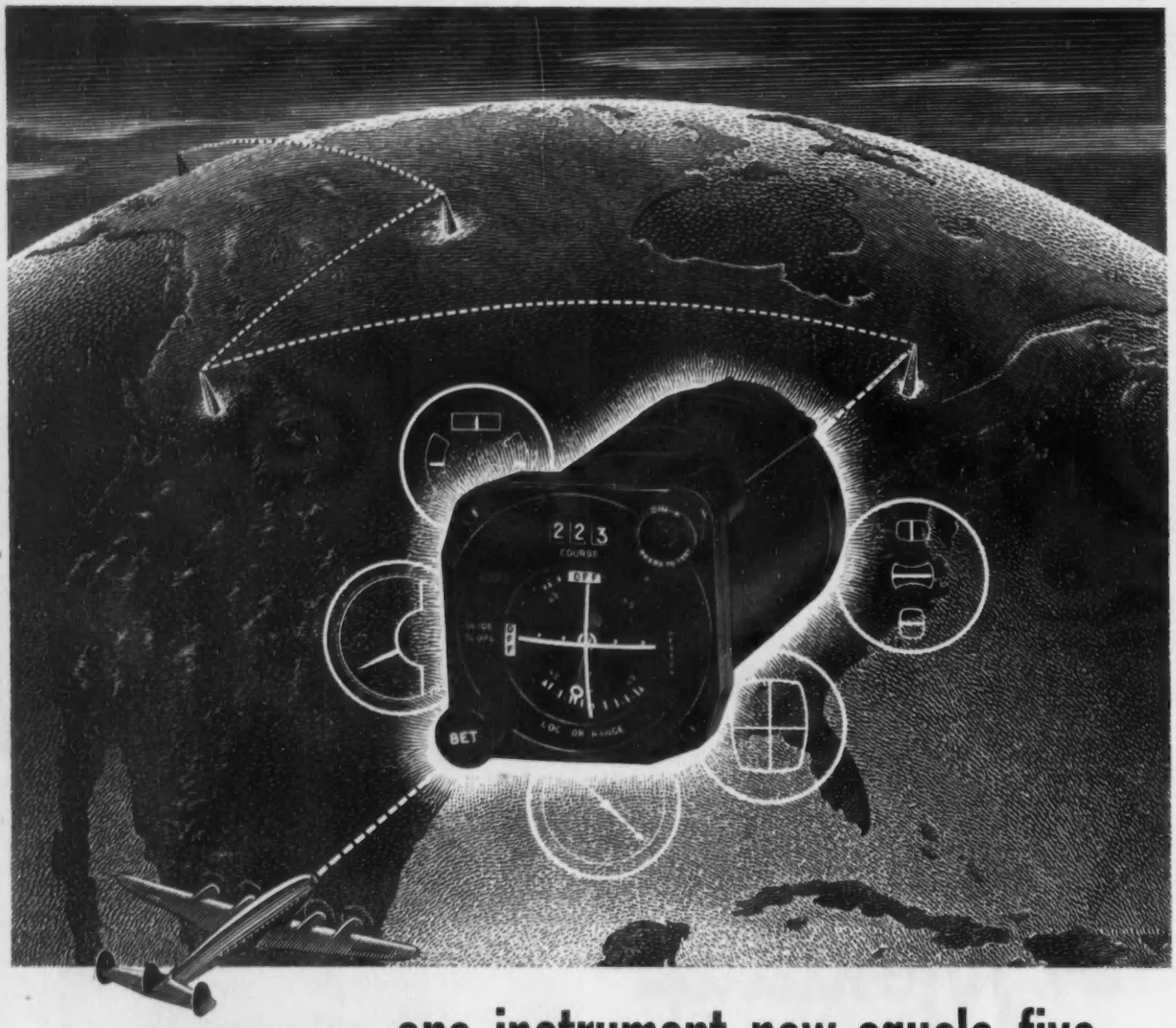
FABRICATORS
ERECTORS

"Builders of Equipment for People You Know"



Flying Omni Range...one instrument now equals five

You'd almost think it incredible that the functions of as many as *five* basic navigation instruments could be combined in just one instrument... an instrument measuring only 3⅛" in diameter *at that*.

Such a reduction saves considerable space on the instrument panel, where space and weight savings are vital. But the outstanding advantage of this Weston Course Indicator is the fact that it reduces *reading locations* from five to one... thus making readings simpler and quicker, and greatly reducing pilot fatigue.

The indications which this one instrument supplies include: course indications, pictorial heading, deviation, ambiguity, and instrument landing. Its development, therefore, required designing into just one small case, *five* highly sensitive instrument movements, *three* synchronous motors, a *course selector*, and a *marker beacon lamp*.

Such a development obviously called for engineering design skills, and painstaking craftsmanship, of the highest order. Not only to compress five into one, but to still build into this instrument the *accuracy*, and *unfailing dependability*, so essential to safe flying.

The Course Indicator furnishes another example of WESTON's leadership... not only in aviation, but on all measurement and control problems whether involving electricity, light, speeds, moisture, temperatures or pressures. WESTON Electrical Instrument Corp., 614 Frelinghuysen Avenue, Newark 5, N. J

WESTON 4605 **WESTON** *Instruments* ... INDICATE—RECORD—CONTROL

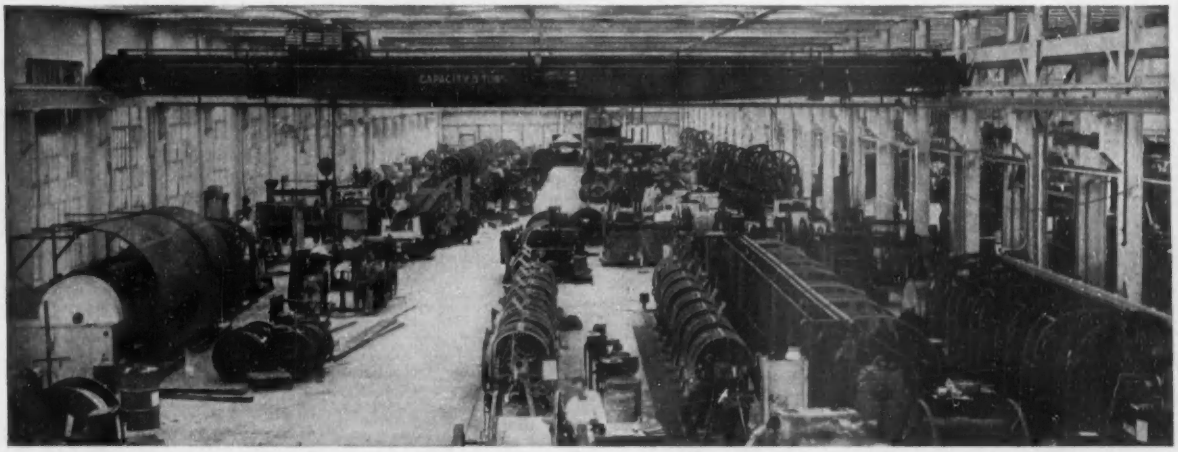
INCREASING USE OF ELECTRICITY CALLS FOR MODERN DISTRIBUTION SYSTEMS

General Electric's expanding wire and cable facilities and services can help you handle new or greater loads

The load doubles every ten years—say competent authorities. This load growth means, of course, that bigger and more flexible distribution and generation systems will have to be planned, installed, and maintained. To assist you, General Electric has expanded its facilities, and is prepared to help you and your customers in the application, use, and maintenance of modern distribution systems.

1 PLANNING AND APPLICATION.

G-E wire and cable specialists are ready to help your customers select and plan cable systems with the capacity and flexibility needed for their growing loads.



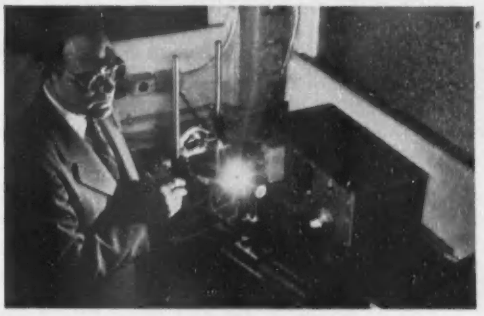
2 WIRE AND CABLE AVAILABILITY.

General Electric is adding a new wire and cable plant to its facilities in Bridgeport, Connecticut, to continue to supply you and your customers with products on which distribution and generation systems depend. This new plant will be able to produce more cable faster, and will supply you with new cable products to meet new needs.

If you want help NOW . . . just call your G-E wire and cable specialist, or write Section W124-127, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—

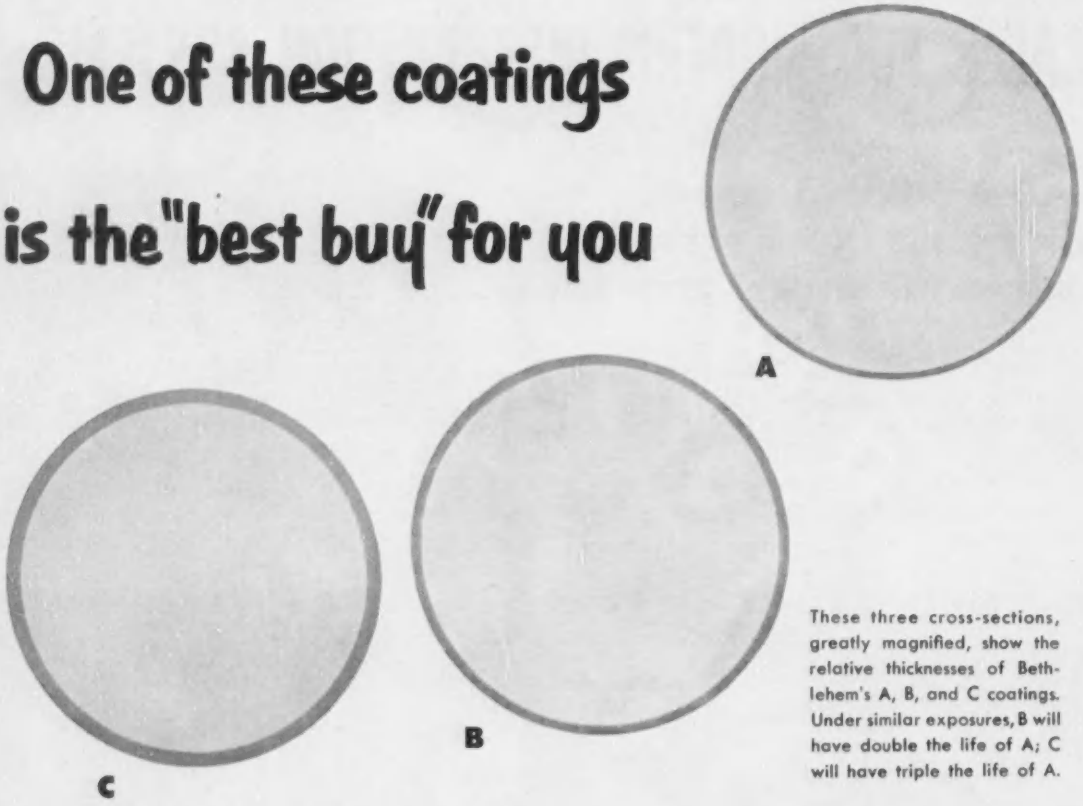
GENERAL ELECTRIC



3 MAINTENANCE OF CABLE SYSTEMS.

General Electric's test facilities help minimize maintenance problems. Thorough production-line testing, coupled with research and developmental testing, give you wire and cable products with longer life and coordinated insulation levels. (This spectrographic test for copper conductor purity is one example of G.E.'s laboratory testing.)

One of these coatings is the "best buy" for you



These three cross-sections, greatly magnified, show the relative thicknesses of Bethlehem's A, B, and C coatings. Under similar exposures, B will have double the life of A; C will have triple the life of A.

Bethlehem strand is available not with one, not with two, but with *three* separate coatings known as A, B, and C. So far as quality is concerned, there is absolutely no difference. All three coatings are highly-pure zinc, applied electrolytically so that the zinc won't peel, crack, or check. This method of application is called bethanizing.

The difference in the three "jackets" is simply one of thickness. Coating A, the lightest, equals extra-galvanized. B is twice as thick as A; C, three times as thick as A. All these coatings meet the requirements of the standard ASTM specifications.

Thus, under the same conditions, the heavier coatings will last years longer—yet the extra cost is very small. For many installations the A weight is wholly satisfactory, but where pole structures, fittings, etc., are designed for the long-term jobs, then strand with a thicker coating—B or C—is the better choice. In other words, strand life should be matched to the life-expectancy of the line as a whole.

So, in choosing a strand, don't limit yourself to a type that offers only a single coating weight. Remember that Bethlehem offers you three, and that each has its field of applications.

Care for more details? Upon request we'll gladly furnish complete information, with specific data.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHANIZED STRAND

BETHLEHEM STEEL

How THE NATION'S LEADING PIPELINES USE

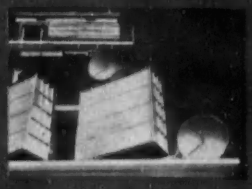
PHILCO *MICROWAVE*

Philco Microwave is being used daily by the Nation's leading pipeline companies. These pipeline companies have selected microwave because: (1) it is an economical, reliable and expandable communications system eliminating costly and vulnerable wire lines, and (2) it provides them with private, dependable communications over long distances, cutting maintenance costs to a minimum.

Pipelines stretching over hundreds of miles can be operated and controlled from a single point by microwave. Pressure, rate of flow and tank level readings can be recorded automatically and relayed to headquarters or various points along the route. Philco Microwave carries telephone, teletype, control and telemetering channels . . . *and offers complete tie-in with VHF two-way radio systems and existing wire line facilities.*

Shown here are two of the many Philco Microwave systems that provide the nation's leading pipelines with modern and efficient communications.

OTHER INDUSTRIES USING PHILCO MICROWAVE



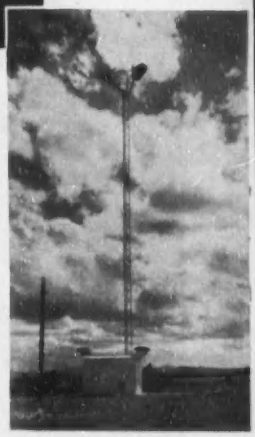
Communication companies use Philco Microwave for telephone, telegraph and television transmission. Reliability, economy and quality of transmission make Philco Microwave ideal for their use.

Philco Microwave is being used by leading railroads for telephone, telegraph and train dispatching. Microwave is a private system, saves costly wire installations and simplifies right-of-way problems.

Utilities rely on Philco Microwave for the control of power stations, dispatching of repair trucks and communication. Dependable channels, unaffected by adverse weather, are a necessity for utility use.

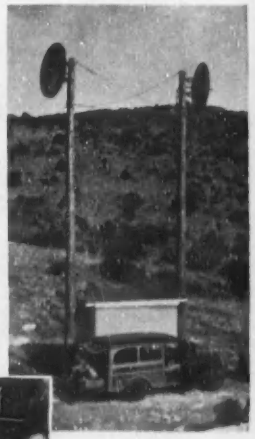
For complete details, write to Dept. BW today!

From this central console headquarters at Kansas City, Missouri, the entire Platte pipeline and communication system can be controlled and monitored.



Platte Pipe Line Company's microwave system is over 1000 miles long . . . to provide every communication and control facility: voice channels, remote supervisory control, continuous or selective telemetering, teletype, alarm signaling and VHF radio. This entire microwave system was surveyed, designed and installed by Philco.

Typical Philco Pipeline Installations



El Paso Natural Gas Company has 500 miles of Philco Microwave with an average distance of 50 miles between stations. This New Mexico to Arizona system consists of repeater and terminal stations, multiplexing equipment for system party line and VHF radio channels.

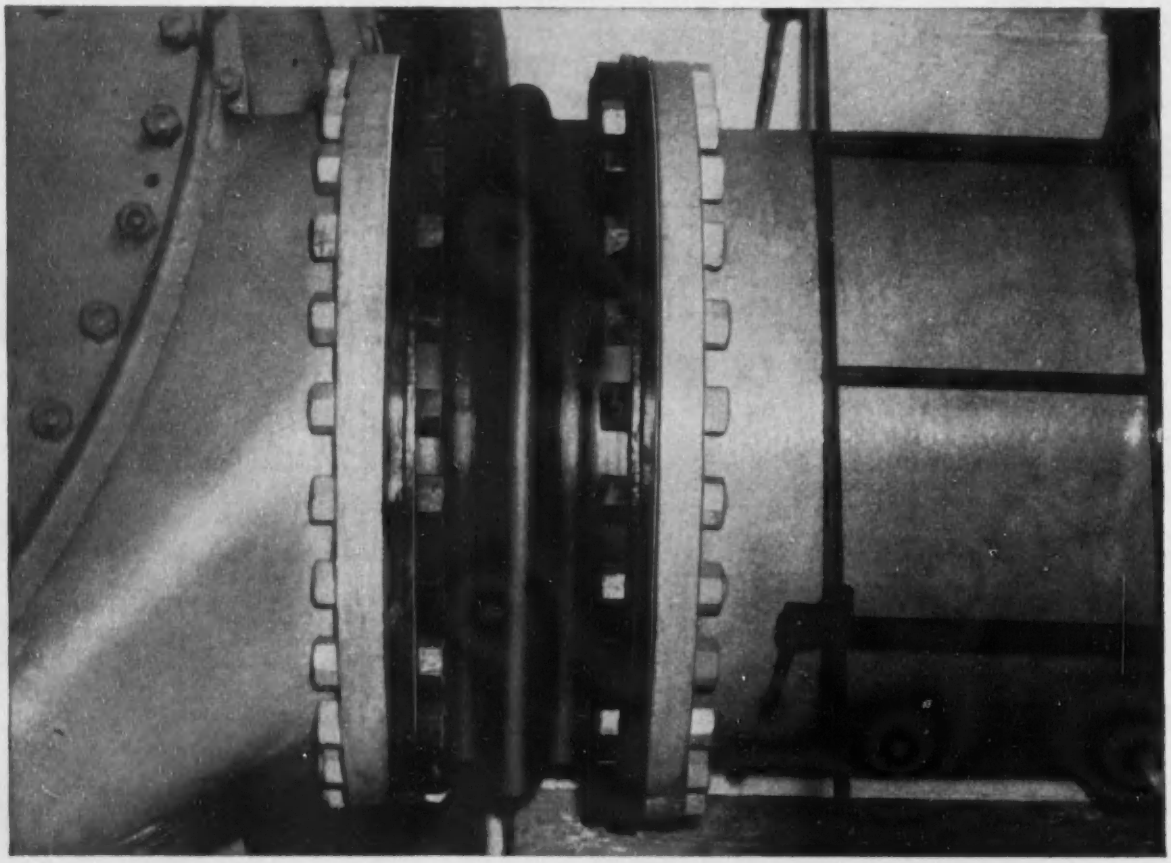
The longest microwave hop in the nation is this 81-mile El Paso hop from Mount Elden to Dilkon, Arizona . . . typical of the utilization of terrain advantage by Philco.

PHILCO *Means Quality the World Over*

PHILCO CORPORATION

GOVERNMENT & INDUSTRIAL DIVISION PHILADELPHIA 44, PA.

28 years old... but there's a lot of life in the old joint!



U.S. RUBBER
SERVING THROUGH SCIENCE

"U.S." Research perfects it
"U.S." Production builds it
U.S. Industry depends on it

Back in 1926, this 30" x 12" U.S. Expansion Joint was installed in a Louisiana power plant. This rubber joint is still in fine working condition. Age has not impaired its efficiency. Three other U.S. Joints in this plant are the same age, are still performing well... and one of them has been used continuously in the valve end inlet header water circulation line in a *very moist location.* Our service engineers report it has many more years of fine service still ahead!

In United States Rubber Company's Expansion Joint Line are standard types to meet the majority of general industrial requirements on pressure or vacuum lines—insulating against vibration, compensating for expansion or contraction. Joints can also be designed and built to meet your own specifications. You can always rely on U.S. Expansion Joints to lengthen the life of equipment, save many times their original cost.

Get in touch with any of United States Rubber Company's 25 strategically located District Sales Offices, each staffed with engineers to serve you, or write to address below.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

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100,000 CUTTINGS WITHOUT FAILURE

PROVE LONG LIFE OF

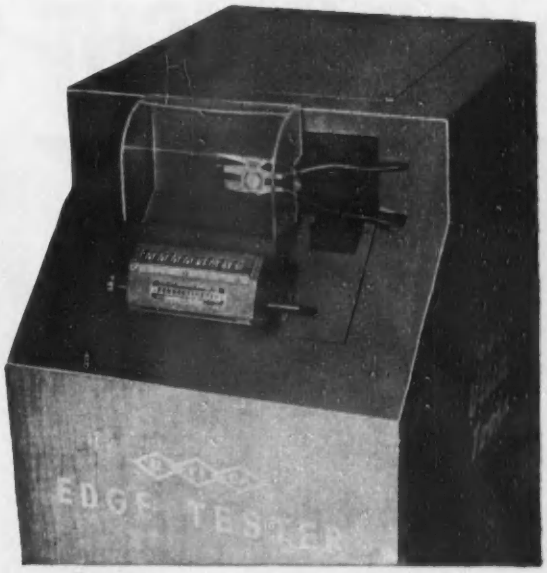
UTICA TOOLS®

All across the country where this automatic edge tester has been demonstrated with UTICA® pliers, thousands have marveled at the rugged, long life of the UTICA cutting edge.

Pliers used are standard, out of UTICA stock, and the wire is .080 hardened steel plow wire (Rockwell "C" 47 Tensile Strength 224,000 P.S.I.). UTICA standards require at least 100,000 cuttings — yet this minimum is often exceeded in our continuing laboratory tests.

The secret is UTICA's own process of extra hardening the cutting edges. Ask for UTICA, and get the benefit of longer tool life.

Note that in this grueling test all cuttings are made at precisely the same points of cutting edges. In actual use, the wear would be somewhat distributed.



UTICA® SCREW DRIVERS

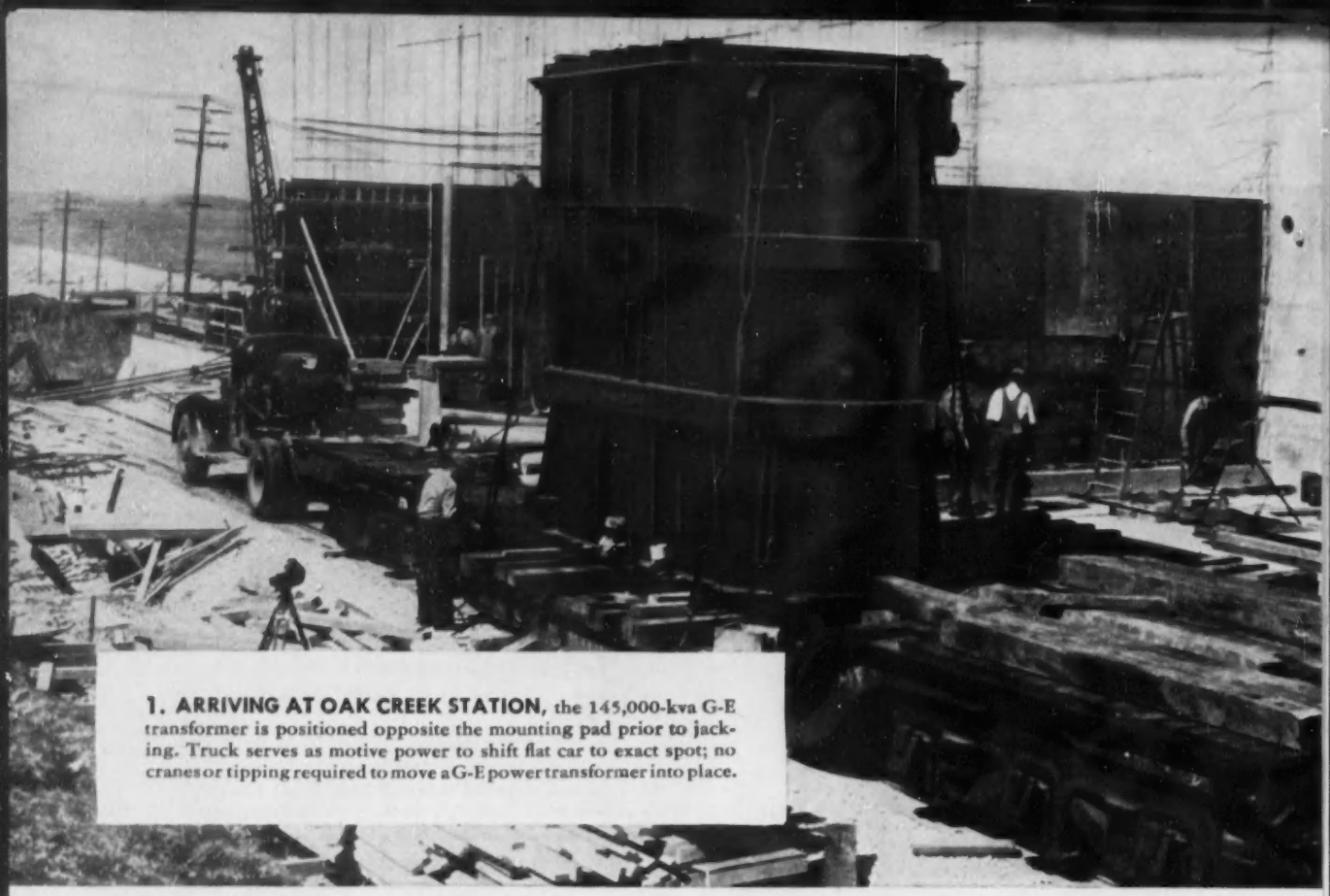
Ask about the new line of UTICA Screw Drivers — typical in quality of all tools by UTICA.

it pays to sell quality tools — U TI CA® — and the world's best tools are made in U.S.A.

DROP FORGE AND TOOL CORPORATION

UTICA 4, NEW YORK

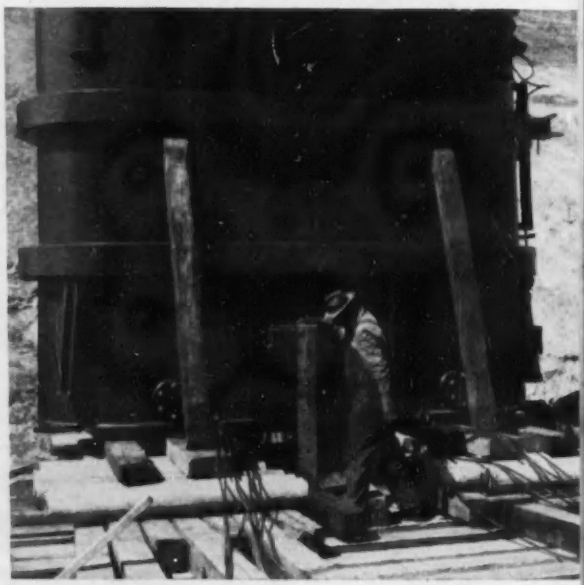
In Canada
ADLAM TOOL & SUPPLY CO., LTD., MONTREAL



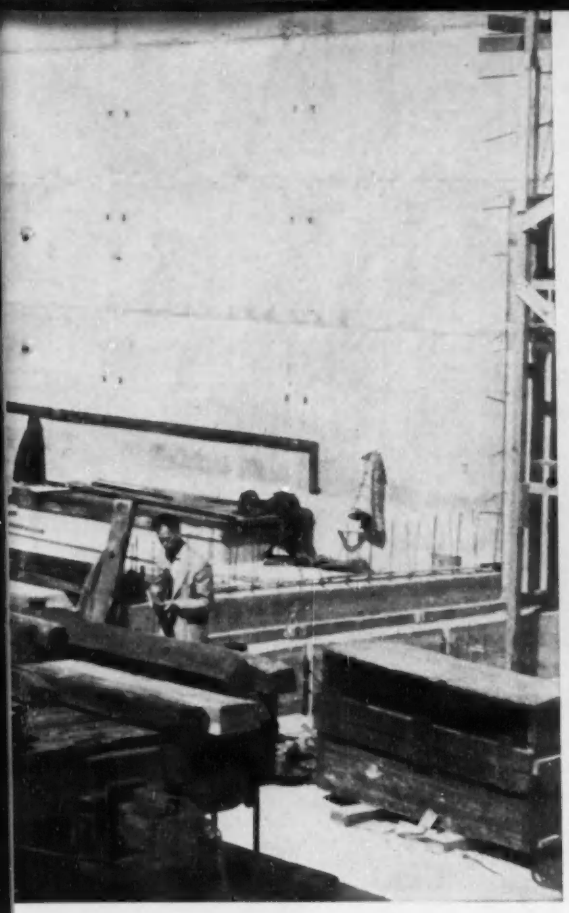
1. ARRIVING AT OAK CREEK STATION, the 145,000-kva G-E transformer is positioned opposite the mounting pad prior to jacking. Truck serves as motive power to shift flat car to exact spot; no cranes or tipping required to move a G-E power transformer into place.

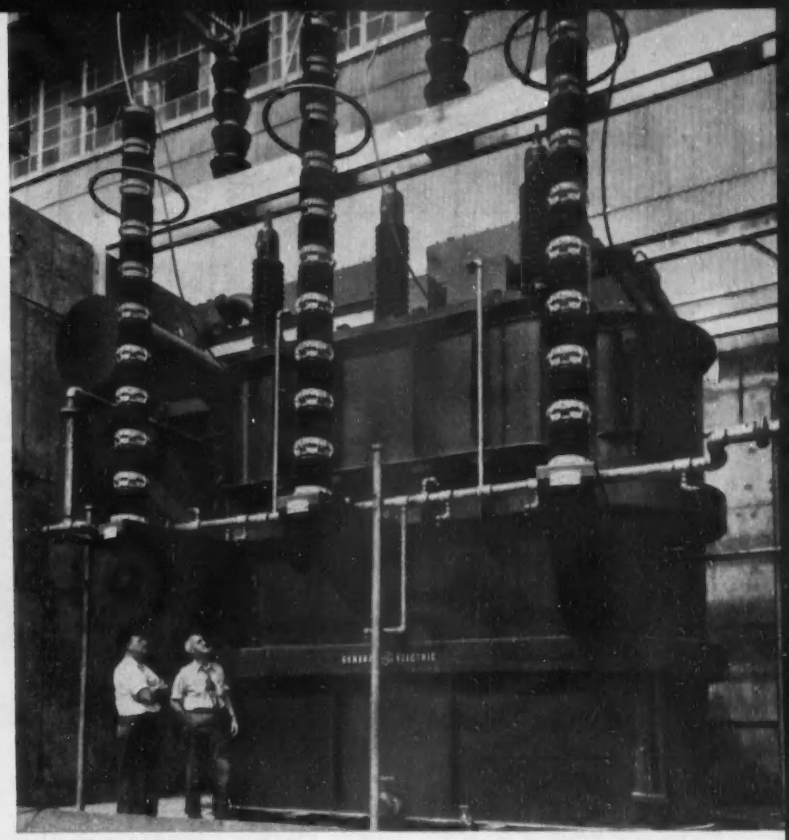
UPRIGHT SHIPMENT SPEEDS

2. AFTER JACKING the unit is ready to be moved to the pad. Next step is to put wooden rollers in place. Total time required for jacking, positioning skids and rollers, and moving unit to foundation was 2½ days. Only truck winches were needed.



3. BLOCKS ATTACHED and ready to start rolling. Workman checks position of rollers before starting the shift from flat car to pad. While nearness of siding to pad helped reduce time, upright shipment simplifies any installation.





4. UNIT IN PLACE with bushings, cooler connections, and arresters installed. Only 4 operations were necessary to complete the installation of this 145,000-kva G-E transformer. Upright shipment makes the job easier!

G-E TRANSFORMER INSTALLATION

145,000-kva units for WEPCO shipped upright in one-piece tanks for easier, faster installation—at less cost

One of two General Electric 145,000-kva forced-oil water-cooled power transformers is shown being installed at the new Oak Creek station of Wisconsin Electric Power Company. These units are step-up transformers applied to raise generator voltage from 13,200 volts to 138,000 Gr Y for high-voltage transmission.

Installation was faster due to G-E one-piece tank construction and upright shipment. Installation time ran as follows: Jacking, 2 days; moving to pad, ½ day; installing bushings, 1 day; filling with oil and installing accessories, 1 day.

Only 4 operations are required to install large G-E power transformers:

1–Slide off flat car onto pad—no tipping, no top tank-sections to assemble.

2–Install bushings, radiators, and accessories.

3–Fill with oil and connect oil preservation equipment

4–Connect to line and energize.

Upright shipment saves time, money. Instead of arriving on its side, or in sections—which would require expensive tipping and assembly operations—all G-E transformers arrive upright . . . ready to slide off the flat car to the foundation. This means that G-E transformers can be installed faster and easier. Utilities report that upright shipment has saved them up to $1750 per unit in installation costs.

Why can G-E units be shipped upright? All G-E transformers have concentric windings. These windings have higher thermal, mechanical and electrical strength, yet are very compact. They permit transformers to be fitted into smaller tanks which can be shipped in the upright position.

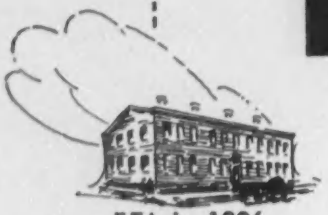
For full information about G-E power transformers, get in touch with your nearest G-E Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y.

421-12

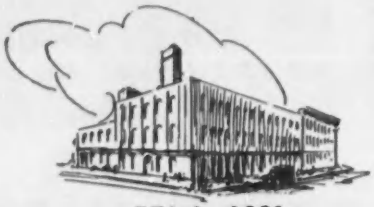
You can put your confidence in—

GENERAL ELECTRIC

ETL



ETL in 1896



ETL in 1921

ETL in 1954

Shedding light on management's problems of production and marketing for 57 years, — providing aid from ETL's electrical, mechanical, chemical, photometric and physical laboratories. This aid is outlined in a booklet sent on request.

Know ETL *by Test*

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INSPECTIONS • RESEARCH • CERTIFICATION

ELECTRICAL TESTING LABORATORIES, INC.

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Transmission Towers

designed to carry any load ...to fit any terrain!

Recent high voltage line towers by AMERICAN BRIDGE

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Ohio Power Company
Public Service Company of Indiana
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AMERICAN BRIDGE steel towers carry many thousands of circuit-miles of transmission lines across this great land. Scaling the heights of rugged mountains; through marshy lowlands, traversing every conceivable kind of terrain, these steel transmission towers are helping make America's great power distribution system the world's best.

American Bridge towers are made to order for every type of transmission line service. They are designed for simplified erection on level, side-hill, or rocky butte sites. They are engineered for heavy-duty service under the severest climatic conditions.

Incorporating special design features such as steel grillage earth anchors and variable leg extensions, American Bridge towers make possible important savings in time, labor, and material costs.

The technical knowledge and experience American Bridge has acquired in more than fifty years of designing, fabricating and erecting towers may be just the answer to your problems. Our engineers welcome an opportunity to figure on your requirements. Just write our nearest office.

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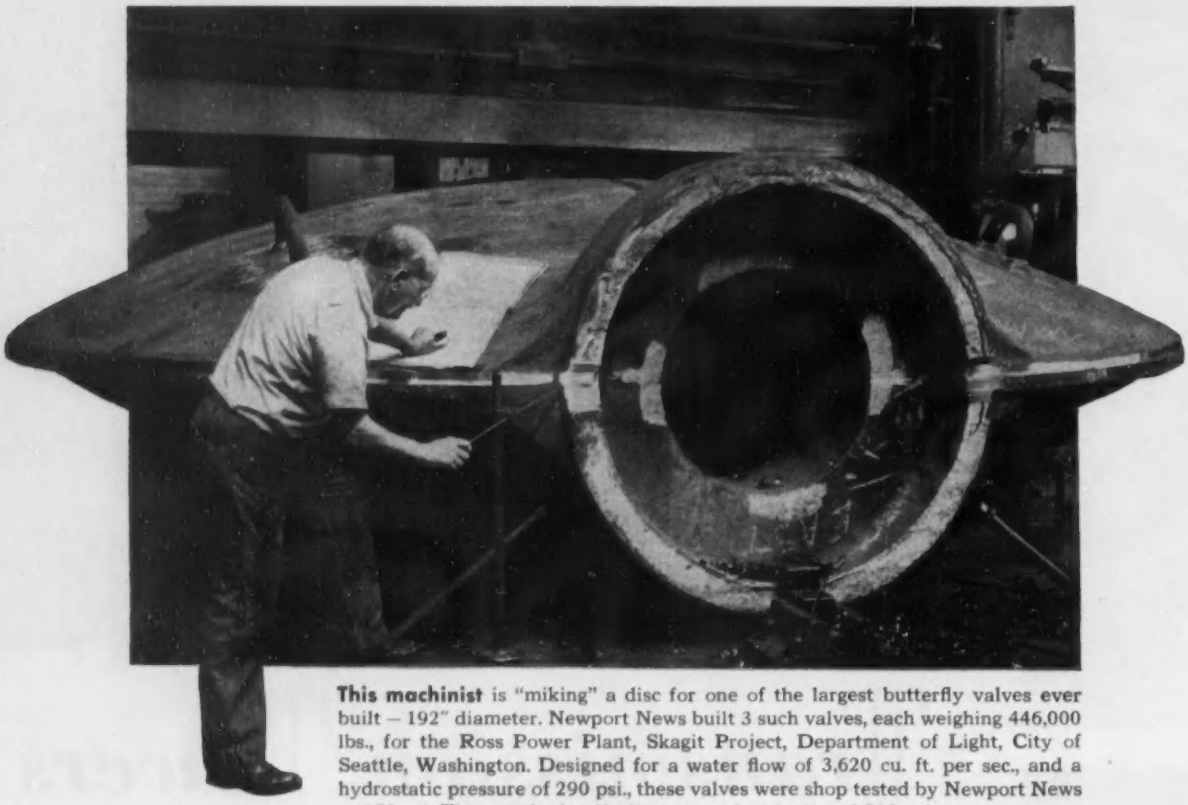
UNITED STATES STEEL



This machinist is "miking" a disc for one of the largest butterfly valves ever built – 192" diameter. Newport News built 3 such valves, each weighing 446,000 lbs., for the Ross Power Plant, Skagit Project, Department of Light, City of Seattle, Washington. Designed for a water flow of 3,620 cu. ft. per sec., and a hydrostatic pressure of 290 psi., these valves were shop tested by Newport News at 450 psi. They are hydraulically operated with oil at 1,500 psi. pressure.

Birth of a **200-ton** Butterfly

This disc for a 16-foot butterfly valve reflects two basic advantages of Newport News fabrication...

First, it exemplifies the *careful attention* Newport News craftsmen give to every detail. And secondly, it attests to the *quality* with which Newport News produces in massive equipment for public utilities and allied industries...due to Newport News' high integration of skill and production facilities.

Additional advantages accrue to customers from extensive work conducted in Newport News' testing laboratories on problems related to water power equipment.

Avail yourself of the engineering talent, along with the specialized production techniques and the skill of Newport News craftsmen operating vast steel fabricating shops, five huge machine shops, drop forging and die facilities along with acres of brass, iron and steel foundries.

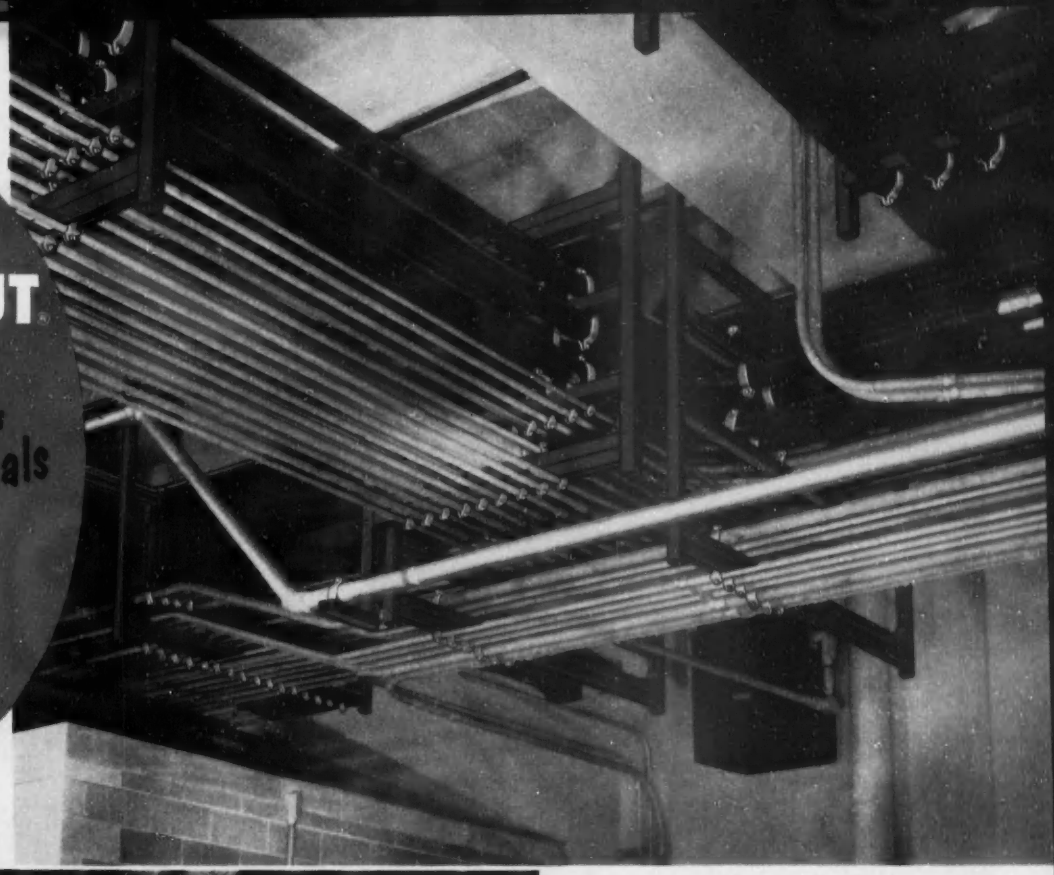
Let us bid on equipment for your present or future projects. If you are not familiar with the way Newport News can help you, write for our illustrated booklet entitled "Water Power Equipment" ...it's yours for the asking.

NEWPORT NEWS

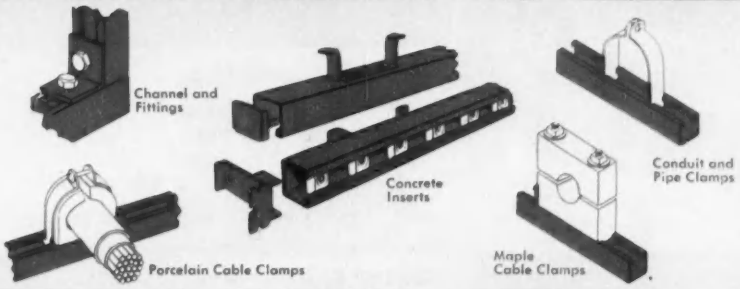
Shipbuilding and Dry Dock Company
Newport News, Virginia

UNISTRUT concrete inserts, steel channel, fittings and clamps support maze of conduit in trapeze style framework.

ADJUSTABLE UNISTRUT® FRAMING saves time, space, materials in large chemical plant



View shows how UNISTRUT nut and bolt assembly permits speedy erection, changes or additions at any time.



Conduit and Cable Installed Faster, Easier, for Less, at Kaiser Aluminum & Chemical Corporation's new Chalmette, La. plant

Versatile UNISTRUT steel structural supports reduce engineering detailing, permit rapid, on-the-job erection, allow changes or additions at any time.

This simple-to-assemble framing system consists of steel channel and fittings, clamps, brackets, hangers and concrete inserts—provides all you need to mount, frame, suspend or support all kinds of electrical equipment with just a hacksaw and a wrench.

No drilling, no welding, 100% adjustable and re-usable—there is no waste. Try UNISTRUT framing on your next job!

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THE WORLD'S MOST FLEXIBLE ALL-PURPOSE METAL FRAMING

Write for FREE 84-page Pocket Catalog No. 800
For the MAN ON THE JOB. Photos, drawings, ideas and data on how to frame, mount, rack and support electrical and mechanical equipment with UNISTRUT metal framing.

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2363382 2390379 2405631
2541908 Other Patents Pending

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FORMULA for Cutting Production Costs

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= GREATER SAVINGS PER FUEL DOLLAR

Control Center for 125,000 KW reheat boiler-turbine Unit No. 1 at Meramec Station, Union Electic Co. of Missouri. Bailey MINI-LINE Equipment on benchboard gives operators fingertip control while larger recorders on vertical board show operating trends and make permanent records.

Steam Cost

★ Close regulation of fuel and air input is vital to a strict control of your steam cost. But that's not all. You'll need control of other factors, too. Your power costs can be held down only by controlling all of the important operations in your steam plant. That's where you can be sure of help from Bailey Controls. Here's why they can do the job and do it right:

1. Complete Range of Equipment—fully co-ordinated

You need never worry that a Bailey Engineer's recommendation is slanted in favor of a particular type of equipment, as might be the case if he had only a limited line to sell—or that Bailey will pass the buck for efficient control; we offer *complete* boiler control systems.

2. Engineering Service—backed by experience

No other manufacturer of instruments and controls can offer as broad an experience, based on successful installations involving all types of combustion, flow measurement, and automatic control.

3. Direct Sales-Service—conveniently located near you

Bailey Meter Company's Sales-Service Engineers are located in more industrial centers than those of any other manufacturer of boiler control systems; you get prompt, experienced service with a minimum of travel time and expense.

For close control of steam cost, more power per fuel dollar, less outage, and safer working conditions, you owe it to yourself to investigate Bailey Controls. Ask a Bailey Engineer to arrange a visit to a nearby Bailey installation. We're proud to stand on our record: "More Power To You!"

A-120-2

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Controls for
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LIQUID LEVEL
FEED PUMPS

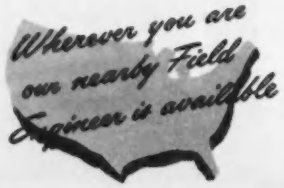
when industrial turbo-generators go bad National gets them back to work **FAST**

When unexpected turbo-generator failure cripples your operations, call National. Your generator will be back on the job in a hurry. Delivery of the rewound unit, or of the necessary rewinding materials, can be made with startling speed because all of the wire and insulating materials used in your windings are fabricated right in the National plant.

National facilities for servicing industrial turbo-generators include large lathes, balancing machines and other tools for mechanical repairs as well as complete equipment for the production of rotor and stator windings. But the big plus value in National service is "know-how". Skilled workmen who know that careful coil installation can make a big difference in the service life of your generator. Engineers who know how to spot and correct the little defects which can bring you big savings in maintenance costs.

National stands for fast service. Yes, but not at the expense of quality. Frequently, in fact, National engineers are able to introduce modifications of design or materials that will make your generator better than ever. "As good as new" is not good enough for National. That's why National rewinding pays for itself so quickly.

No matter what kind of rotating electrical equipment you operate — if it's giving you trouble, call National.



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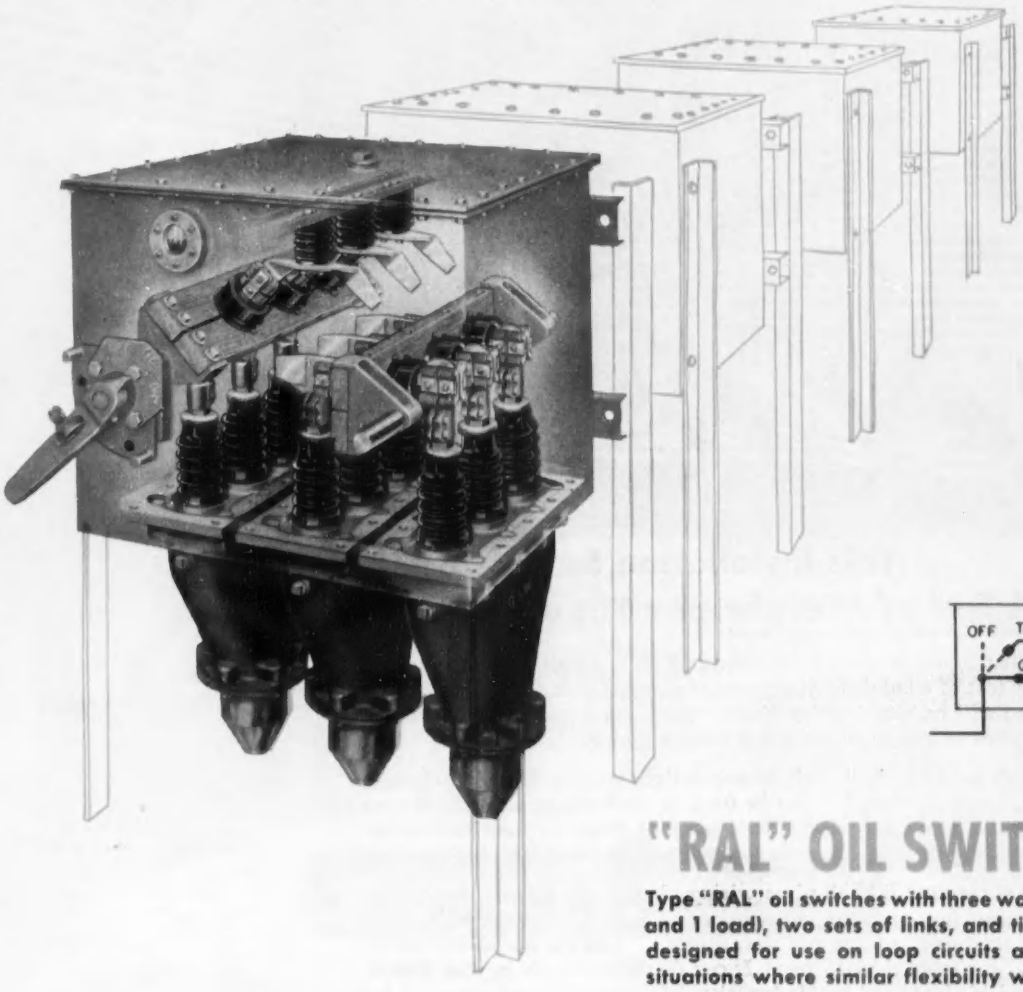
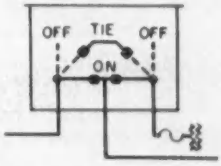
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

PROVIDE SAFE SECTIONALIZATION FOR CABLE SYSTEM FLEXIBILITY WITH G & W LOAD BREAK OIL SWITCHES





D521A

"RAL" OIL SWITCHES

Type "RAL" oil switches with three ways (2 feeder and 1 load), two sets of links, and tie buses are designed for use on loop circuits and in other situations where similar flexibility would otherwise require three separate oil switches with correspondingly greater expense for equipment, installation, and space.

These oil switches materially reduce the length of time required for restoring service in case of trouble, or for isolating a circuit to make changes. Load break disconnection of a circuit is accomplished by manually operating an external lever —without opening the tank or breaking the oil and moisture seals.

Bulletin DB51 gives complete data and prices. Write for your copy or ask your representative.

Standard "RAL" oil switches in 7500 and 15000 volt ratings are now assembled from stock parts for shipment in 4 or 6 weeks.

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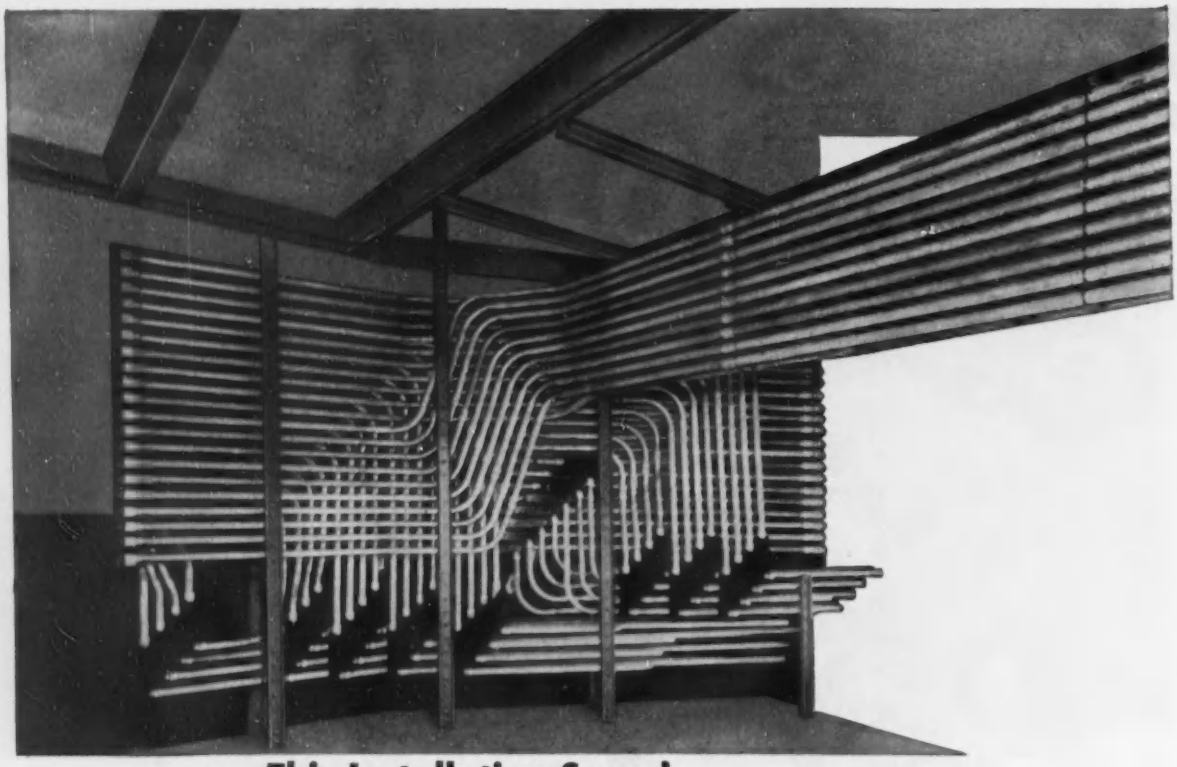
Representatives in principal cities of U. S. A.
In Canada—Powerlite Devices, Ltd., Toronto and Montreal



This Installation Saved
A Ton of Weight per Thousand Feet

That figure is for 2" ELECTRUNITE E.M.T. Apply it to the number of feet of conduit in your present plants. Or in future ones which are still on the drawing board. You'll get a good idea of what it means to use Republic ELECTRUNITE E.M.T.

This modern, rigid steel raceway is light weight. It's easy to handle . . . easy to install. It can be used in close quarters. Intricate runs can be duplicated. And there's less load to lift . . . less load on the building structure. Result: lowered building and installation costs.

ELECTRUNITE E.M.T. gives wiring circuits the protection of steel against fire, moisture and mechanical injury. It's been doing this in stations of a large mid-west utility . . . like the one shown above . . . for more than 16 years. It can do the same job in your plants. And it's inspected by Underwriters' Laboratories and approved by the National Electrical code for exposed, concealed or concrete slab construction.

Before you build . . . or revamp . . . get all the facts about ELECTRUNITE E.M.T. . . . the safe, economical steel raceway. Write for SA-53.

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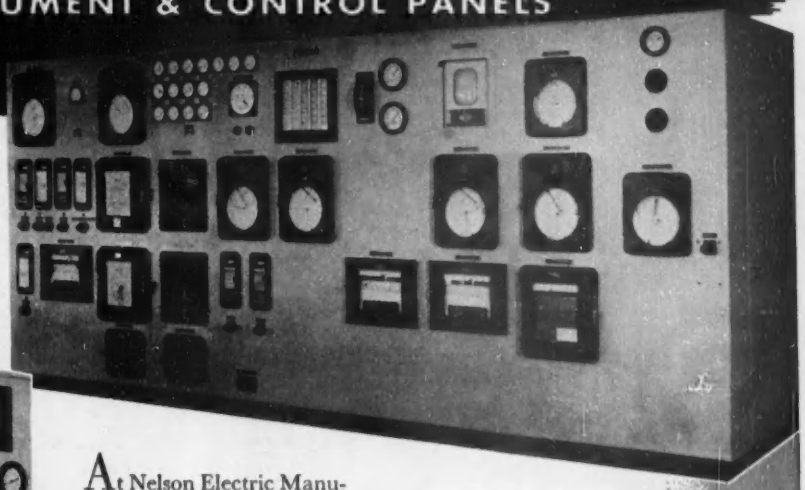
ELECTRUNITE E.M.T.

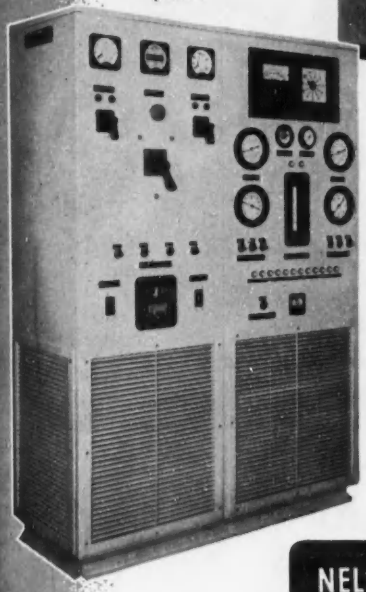
Made by the producers of ELECTRUNITE . . . The Original Electric Welded Boiler Tube

CUSTOM-BUILT
INSTRUMENT & CONTROL PANELS

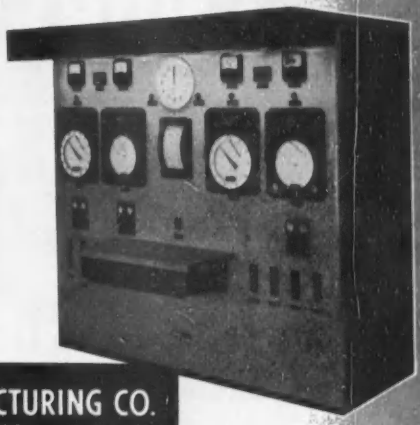


▶ Piped and wired instrument and control panel for power plant.

▼ Engine control panel.



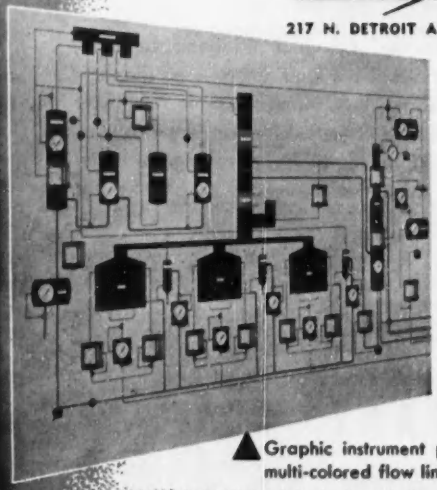
At Nelson Electric Manufacturing Company, engineering know-how and manufacturing skill are utilized in producing custom-built instrument and control panels that meet, in every detail, each customer's requirements. We do all of the design work (if you desire), all fabricating, all wiring, all piping and all testing. Let us quote on your requirements.



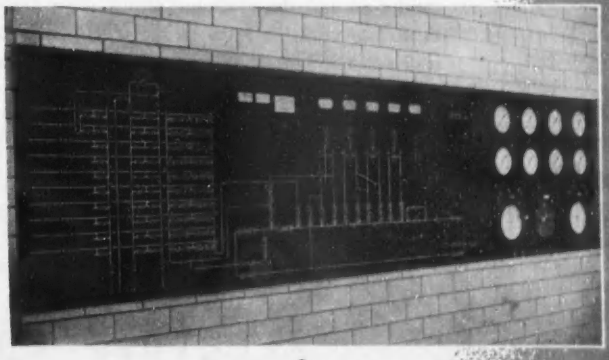
NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

217 N. DETROIT AVE. TELEPHONE 2-5131

▲ Pressurized piped and wired cubicle for kiln control.



▲ Graphic instrument panel with multi-colored flow lines.



▲ Control panel installed in products pipe line station.

makes CORE and STRAND Share the Load

Once the two-bolt clamp is tightened on the Reliable No. 420 Snub Deadend, both the steel core and the aluminum strand carry their full share of the load. There is no slippage that throws all the load on the aluminum strand. The two-bolt clamp is simple to tighten and subjects the ACSR to a minimum of vibration fatigue. This deadend is approved for use without armor tape. No. 420 ACSR Snub Deadend has the added advantage of being extremely light in weight. Many thousands of these deadends are giving unobtrusive yet unfailing service.

Reliable ELECTRIC COMPANY

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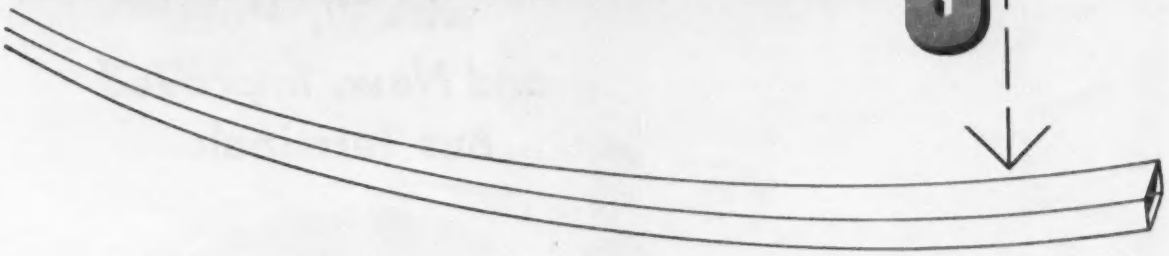
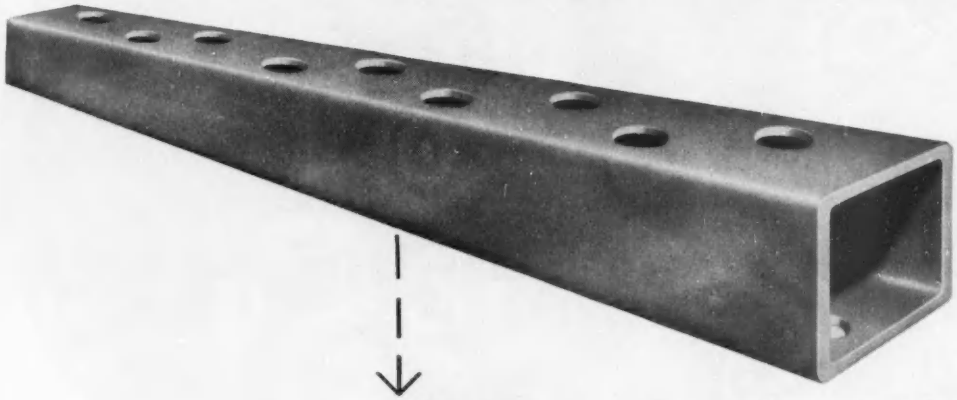
OVER 45 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS and CONSTRUCTION SPECIALTIES

Minimize Sag



with CHASE® COPPER BUS CONDUCTORS



they're stronger...for LONGER spans

Chase one-piece square copper tube buses have high mechanical strength in all directions. Large cross-sectional areas give them maximum structural strength. And that adds up to *longer spans between supports without unduly large sag.*

And, of course, Chase one-piece buses have the mechanical strength necessary to stand up under heavy short circuits.

For further information on Chase ventilated square tube, round tube and flat rectangular bus write for free Chase Bus Conductor Brochure.

FREE Chase Copper Bus Conductor booklet gives physical and electrical characteristics and data on copper saving.

Chase Brass & Copper Co., Dept. EW154
Waterbury 20, Connecticut

Please send me the
CHASE COPPER BUS CONDUCTOR BOOKLET.

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Position_____

Firm_____

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City_____ **State**_____

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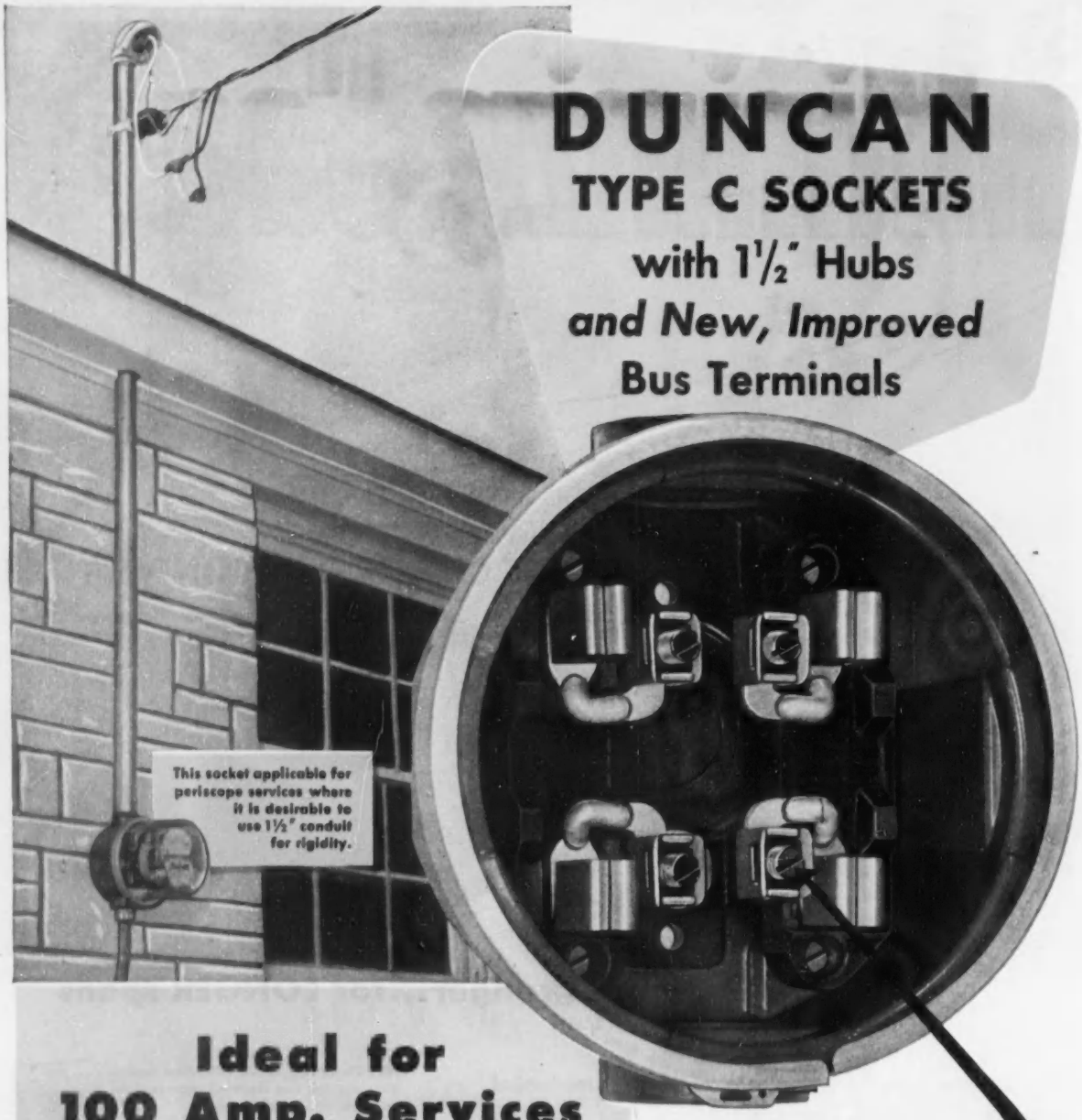
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston	Newark	Rochester†	(† sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	



DUNCAN
TYPE C SOCKETS
with 1½" Hubs
and New, Improved
Bus Terminals

New, improved bus terminals; greater pressure area; greater strength; for conductors up to #2 copper or aluminum.

Ideal for 100 Amp. Services

1. **FOR LARGER CONDUIT**—1½" threaded hubs.
2. **NEW EXTERNAL HUBS**—Provide more interior wiring space.
3. **EASILY WIRED**—Bus terminals suitable for conductors up to #2 copper or aluminum; permit connections without bending conductor. Deep construction gives good "hot" to "neutral" clearance—more space for using back outlet.
4. **PLUS THESE ADVANTAGES**—Non carbonizing terminal blocks . . . One piece, snap-action aluminum sealing ring . . . Flat sides which may be punched for additional outlets . . . Convenient means of rotating jaws for horizontal installations.

DUNCAN ELECTRIC MFG. CO.
LAFAYETTE INDIANA

DUNCAN

makers of watthour meters for over fifty years

why are

BURNDY TERMINALS

specified for
vital
power circuits?

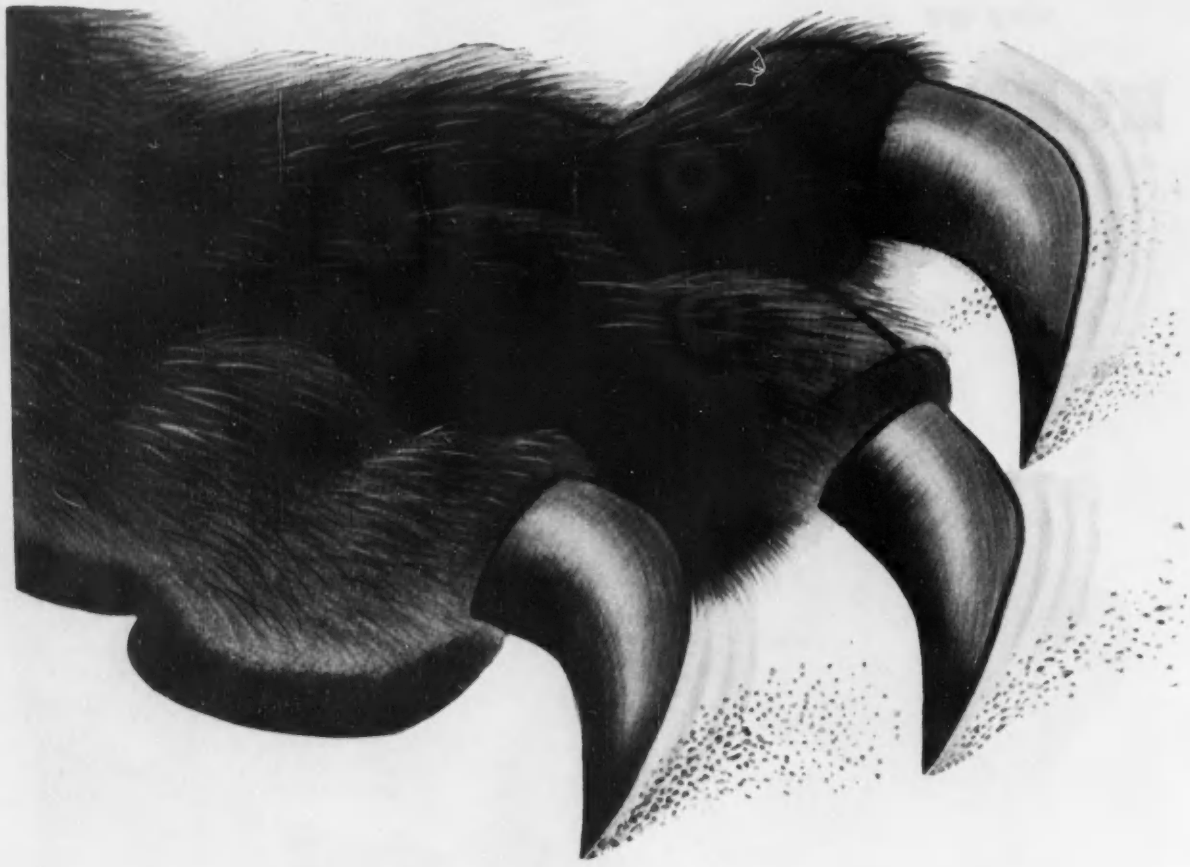
All Burndy power connectors are constructed of selected corrosion-resistant alloys, and engineered mechanically and electrically to assure stable, low-resistance connections under the most severe operating conditions.

Rough-grind finish contact surfaces provide numerous current-carrying paths for maximum conductivity—over 100%. Oval-shank bolts, superior in design and materials, permit one-wrench installations, prevent stress corrosion and season cracking. For detailed listings write for Burndy Power Connector Catalog.

BURNDY

NORWALK, CONNECT. FACTORIES: New York, California, Toronto TORONTO, CANADA
EXPORT: Philips Export Corporation

53-16

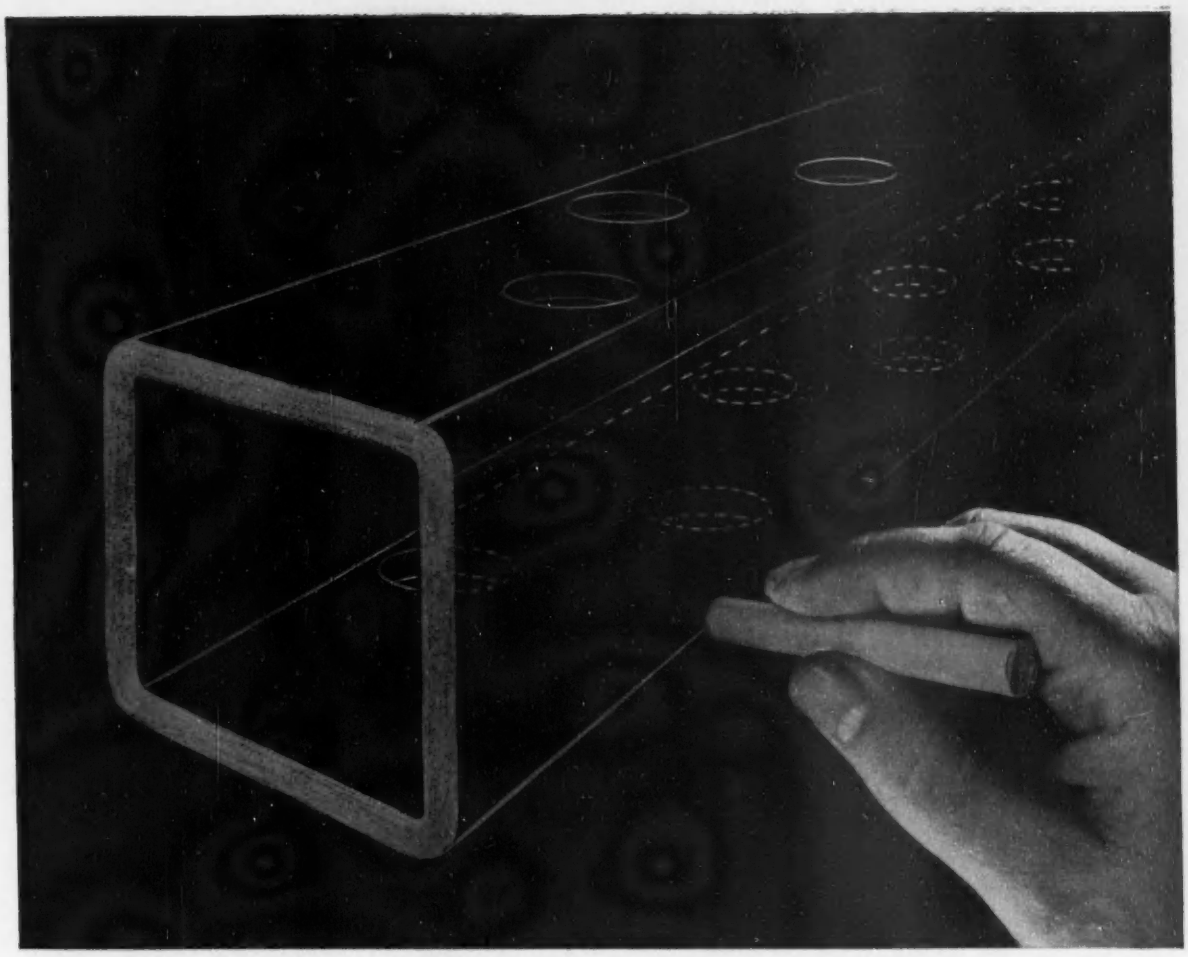


Once it gets a foothold, fire rips into your plant like a monstrous claw. That means you must guard every hazard– flammable liquids, electrical equipment as well as ordinary combustibles– with Kidde Portable Extinguishers or Built-in Systems. Call your Kidde agent today.

The word "Kidde" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc. and its associated companies.

Kidde

Walter Kidde & Company, Inc.
130 Main St., Belleville 9, N. J.



THE ADVANTAGES OF

VENTILATED SQUARE TUBE

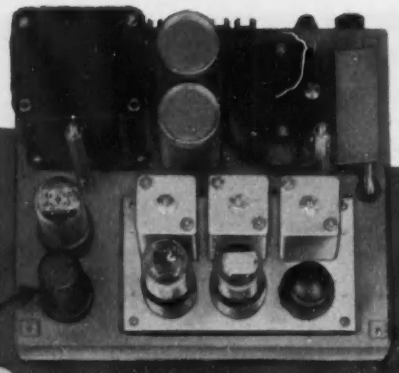
BUS CONDUCTORS

Ventilated square high-conductivity ANACONDA Copper Bus Tubes are perforated with rows of holes drilled on two opposite sides to create active circulation of air across the interior. These "ventilated" bus conductors combine the structural strength of ANACONDA Square Bus Conductor Tubes with a measure of the air cooling advantage provided by the open slots, top and bottom, of the Anaconda double channel construction. Ventilated square bus conductor tubes are used where convection-current air cooling is effective. Under such conditions it is practical to up-rate the capacity of the undrilled conductor section.

There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement. Write today for your copy of "ANACONDA Copper Bus Conductors" containing illustrations and detailed technical information. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.* 88104 Rev.

carry the load with ANACONDA® Bus Conductors

New WESTON
Inductronic® D-C AMPLIFIER
Measures Millivolts to 0.1%!...



The new Weston Inductronic D-C Amplifier measures both millivolts and microamperes to an accuracy previously unheard of. A product of Weston Electrical Instrument Corp., Newark, N. J.

Its resistor network uses D-H ALLOY to assure HIGH STABILITY and ACCURACY

The Weston Resistance Network (Actual size) is wound with D-H Manganin wire to achieve a high degree of stability with extreme accuracy.

When it's millivolts or microamperes you are measuring, you talk in terms of accuracy in the order of 0.1%. Here is the most accurate measuring instrument yet developed — the Weston Inductronic D-C Amplifier. This amazing instrument makes potential measurements down to microvolts, current measurements to fractions of a microampere.

By using this 200 kc frequency shift amplifier in connection with thermocouples, radiation receivers, bolometers, strain gages, pressure transducers, resistance thermometers, photocells, ionization gages, etc., related physical quantities can be measured with speed and accuracy far superior to any other method previously known.

The amplifying system is essentially an automatic potentiometer, wherein an output current is maintained in balance against the input through a method of accurately adjusted resistors determining the balanced ratio of output to input. With a high gain in the amplification of error unbalance, the accuracy of amplification ratio is of course dependent almost entirely upon the *stability* and *precision* of the resistor network.

For this most exacting function Weston uses Driver-Harris MANGANIN, an alloy of such fixed stability that maximum change in resistance between 15°C. and 35°C. is less than *15 parts per million per degree Centigrade.*

If fixed stability and constant resistance under normally variable operating conditions are "musts" in *your* resistor designs, let us have your specifications. We'll gladly put at your disposal 50 years of alloy manufacturing experience to help solve your problem.

Sole producers of world-famous Nichrome®

Driver-Harris Company

HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco, Louisville

In Canada: The B. GREENING WIRE COMPANY, Ltd., Hamilton, Ontario

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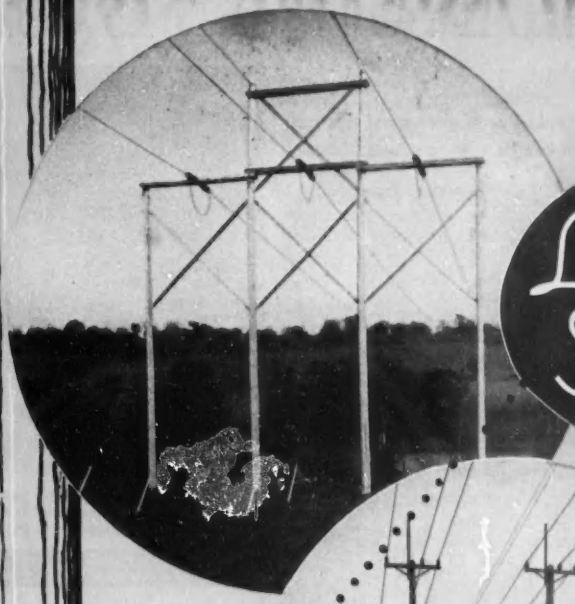
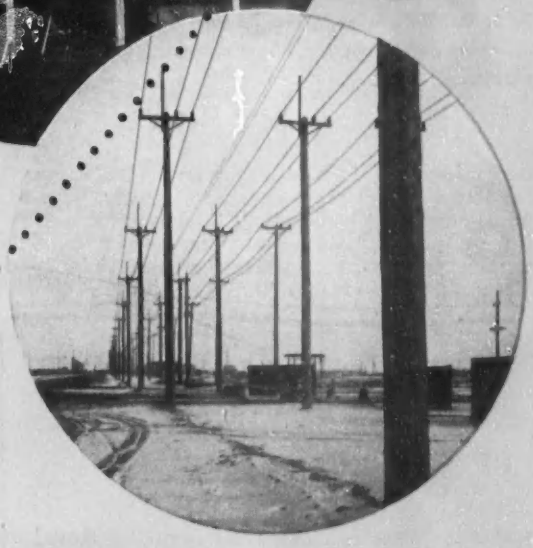
MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

LIFE SPAN *Cedar*

THE POLES THAT REFUSE TO GROW OLD





Life Span

Life Span

After 11 years of continual high-tension-line service, LIFE-SPAN treated Cedar poles are as perfect as they were at the time of installation. They still are 100% protected against deterioration and still retain 100% of the LIFE-SPAN preservative. Service life-expectancy is still ahead for all LIFE-SPAN poles.

A remarkable record which we at Consolidated Treating Co. are proud to report! We are still searching for the *first* LIFE-SPAN pole to show decay, or signs of any deterioration after 11 years of line service. Our chemists are continually making repeat tests on LIFE-SPAN installations in many parts of the country. To date, every pole tested shows true soundness, with years of line service still ahead.

Once the LIFE-SPAN pole treatment is applied, Western Red Cedar poles simply cannot decay!

CONSOLIDATED TREATING CO.

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Sold only by the following:

NAUGLE POLE & TIE CORP.
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ELECTRICAL INSULATION IS OUR SPECIALTY

Q. *What ONE wire and cable producer grows its own natural rubber, and makes its own synthetic rubber?*

A. UNITED STATES RUBBER COMPANY.

Q. *What ONE wire and cable producer makes plastics?*

A. "U. S."

Q. *What is the most important part of wire and cable?*

A. The insulation.

Q. *Who is best equipped to make wire and cable with superior insulation?*

A. U. S. RUBBER—which grows its own natural rubber, makes its own synthetic rubber, manufactures its own plastics.

Tapping rubber from one of the millions of trees on U. S. Rubber's giant plantations in Malaya.

Isn't it logical that a rubber company should make the best wire and cable insulation there is? U. S. Rubber has been a pioneer in insulation for over 70 years—has amassed in that time a stockpile of research data and experience that can't be beat. Electrical insulation is a "U. S." specialty!

Electrical insulation makes the difference between superior and ordinary wire and cable. Conductors of all manufacturers are standard, but insulation must be the best that science can produce. That's why your best bet in wire and cable is U. S. Rubber.

SOME MORE OF THE MANY DIFFERENT VARIETIES OF "U. S." WIRE AND CABLE

UTILITIES: Power Cables · Street Lighting · Royal Cords · Network Cables · Utility Control · Pole & Bracket Cable · Service Entrance · Weatherproof · Zip Cord Pole Fixture Cable · Sup. Control

RAILROADS: Power Cables · Communications · Railway Signal · Royal Cords · Welding Cable · Railway Utility · Sup. Control · Weatherproof

HEAVY INDUSTRY: Power Cable · Royal Cords · Welding Cables · Control Cables · Machine Tool Wire · Building Wire · Switchboard Wire · Thermostat Cable · Bus Drop Cable

Absolute Tops in OZONE MOISTURE HEAT Resistance

U. S. RUBBER'S BUTYL-INSULATED POWER CABLES

These cables are for use on power distribution, street lighting and station control circuits and for general-purpose wiring on circuits up to 8000 volts between phases and at conductor temperatures up to 80 C. The insulation will not crack after four hours in air containing 0.015 per cent ozone. They are light in weight, easy to install and join, and are resistant to oil, heat, sunlight, flame, acids, alkalies and corrosive chemicals. The following are guaranteed test values:

PHYSICAL AND AGING PROPERTIES (MINIMUM VALUES)

	Butyl Insulation			Neoprene Jacket	
	Unaged	After 168 Hrs. in O.B. at 80 C.	After 7 days in Air Oven at 250 F.	Unaged	After 96 Hrs. in O.B. at 70 C.
Tensile, lbs. per sq. in.	600	500	400	1800	1600
Elongation, per cent	400	350	350	300	250

MOISTURE RESISTANCE (MAXIMUM VALUES)

a. Dielectric constant and power factor of insulation after immersion in water at 50 C.

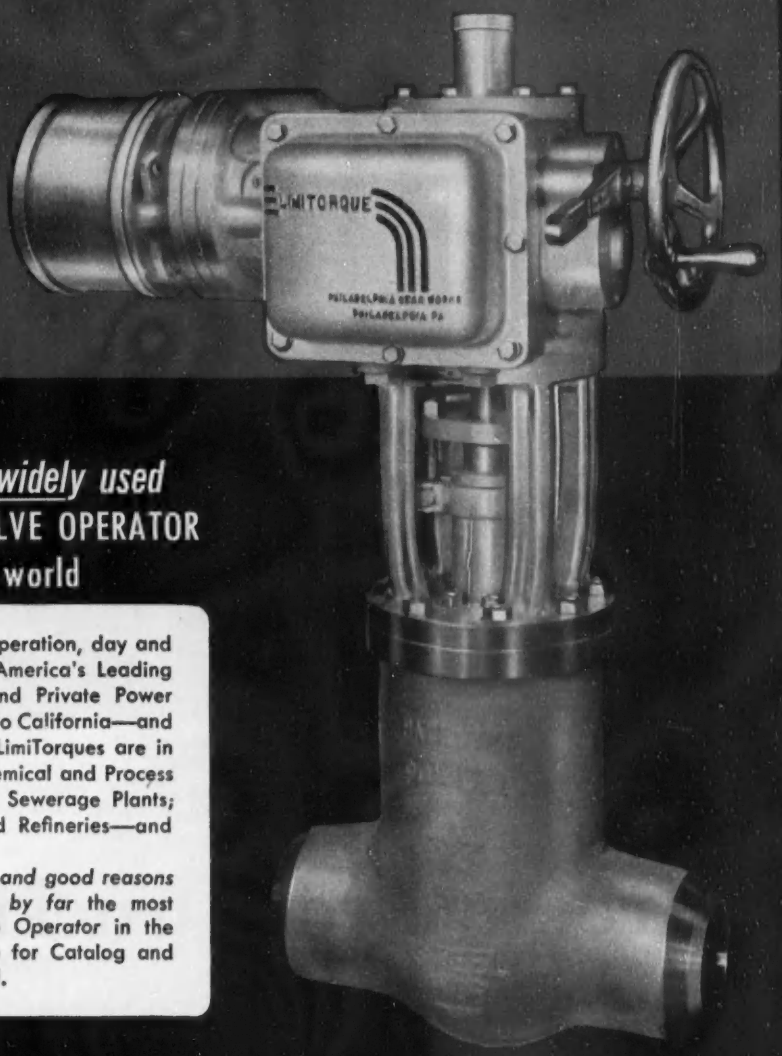
Dielectric constant, one day	4.0
Per cent gain, 1 to 14 days	2.0
Per cent gain, 7 to 14 days	1.0
Power factor, one day, per cent	2.0
b. Mgs. per sq. in., 7 days at 70 C.	15.0

U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE & CABLE DEPT. • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

LIMITORQUE®



...the most widely used
AUTOMATIC VALVE OPERATOR
in the world

Thousands are in operation, day and night in many of America's Leading Central Stations and Private Power Plants, from Maine to California—and too, thousands of LimiTorques are in constant use in Chemical and Process Plants; Water and Sewerage Plants; Oil Pipe Lines and Refineries—and aboard Ships.

There are *many and good reasons why* LimiTorque is *by far the most widely used Valve Operator* in the World. . . . Write for Catalog and you'll be convinced.

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Industrial Gears and Speed Reducers
LimiTorque Valve Controls

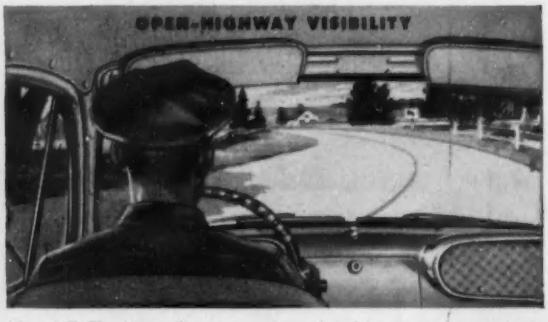
New Dodge "Job-Rated" Trucks...

New! Spectacular low-built lines with pick-up and panel floors as low as 22½ inches from the ground . . . knee-high for loading ease! Lower running boards for easier entry! Lower hood for greater visibility!

New! Great V-8's and thrifty 6's including the most powerful V-8's of all leading trucks . . . with revolutionary hemispherical combustion chamber! Available in 1½-, 2-, 2½-ton . . . standard on 2¾-, 3, 3½-ton!

with new low work-saving design...

New Steering system means easier handling . . . keeps Dodge ahead of the field with sharpest turning of any comparable trucks. More slant to steering wheel post. New power steering available in 4-ton models!



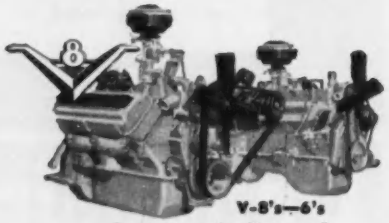
New! Full-vision luxury cabs with big one-piece windshield! More vision area than in any other leading make! New easy-chair seats! New cab sealing against dust, drafts! New two-tone interior styling!

help reduce your trucking costs!

New! Over 75 features! New, low, work-saving, time-saving design! New payload increases! New cab heating and ventilation! New styling from road to roof! New value leader models! New shorter conventional tractors, only 102 inches from front bumper to rear of the cab. New easy-shifting transmissions!

Free book on power! Explains the 3 basic kinds of engine efficiency . . . tells what they mean to you in power and economy! Get your free copy at your friendly Dodge dealer's! See him today!

New! Even greater values...yet still priced with the lowest!



SEE YOUR FRIENDLY DODGE DEALER

NEW DODGE "Job-Rated" TRUCKS

don't flip a coin...

TO CHOOSE CONNECTORS FOR TAPS OR JUMPERS!

Specify ANDERSON

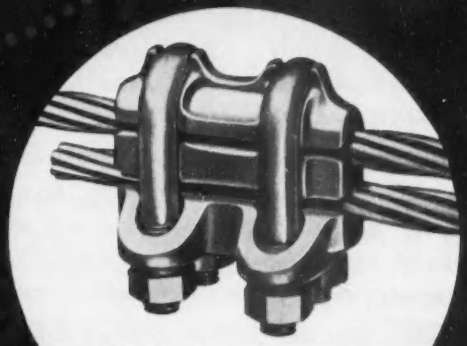
HIGH-TENSILE STRENGTH *Aluminum* PARALLEL CONNECTORS

1, 2, 3, and 4 U-BOLT TYPES

Aluminum to aluminum or aluminum to copper, for *either* cable combination, specify parallel connectors *on the basis of performance!* ANDERSON cast aluminum electrical products are designed, engineered and manufactured to "performance standards" *determined by the most exhaustive tests ever devised for power system applications.*

Before you consider parallel connectors *again*, investigate ANDERSON'S wide range of sizes . . . you may be specifying similar type connectors in sizes much larger than necessary or practical.

LCA-70 A.C.S.R. or Aluminum Cable to A.C.S.R. or Aluminum Cable
LCC-70 A.C.S.R. or Aluminum Cable to Copper Cable



LCU-600 A.C.S.R. or Aluminum Cable to A.C.S.R. or Aluminum Cable
LCU-650 A.C.S.R. or Aluminum Cable to Copper Cable

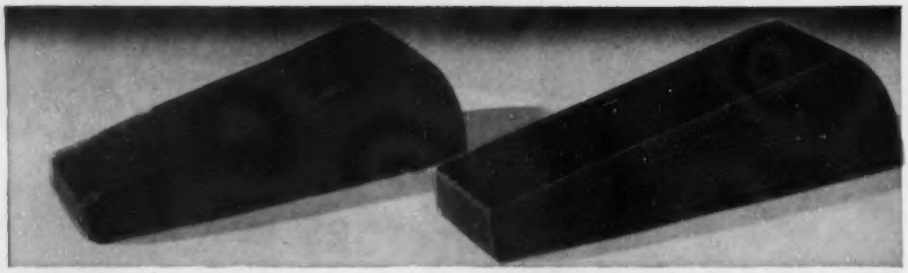
ABW DESIGN MEANS QUALITY *Plus* STRENGTH in the RIGHT PLACES!

Consult one of our nearest 20 representatives or contact our main office.

Aluminum & Bronze **POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES for SUBSTATION • TRANSMISSION • DISTRIBUTION SYSTEMS** *for over a Quarter Century*

ANDERSON BRASS WORKS, INC.

P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA

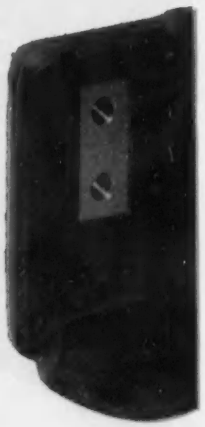


These parallel plugs, used in textile looms, have high impact strength . . . are impervious to oil and water. Will not fracture, chip, delaminate. The plug on left was used for two years! Plugs were made from a canvas-based laminated plastic, strip-molded and cut by C-D-F.

C-D-F Industrial Molded Products

The flexible coupling (left) is made from Celoron molded macerated plastic. Outside surface is smooth, every tooth is capable of carrying heavy loads. Besides its great strength, the coupling is lightweight, smooth and quiet in operation. Coupling material is low cost, resists repeated impacts; is not significantly affected by high temperatures up to 225° F. and is resistant to oil, water, gasoline, many chemicals.

Note brass insert in this molded piece. This is part of an electrical switch component where C-D-F molding techniques built metal into plastic.



All of these rugged products were cooperatively engineered and manufactured by C-D-F. Most were made from tough canvas sheets treated with phenolic resin, then laminated or macerated, and molded under heat and pressure . . . finished to close tolerances. All have high impact strength, excellent resistance to heat, oil and water, many chemicals.

C-D-F pioneered in molded industrial plastics, developed the famous Celoron timing gears for the automotive industry. Because of its long experience, C-D-F is called upon to work closely with the engineering staffs of America's largest companies. C-D-F has both the men and equipment to handle "big run" molding requirements.

C-D-F wants to work with you. Start by calling a C-D-F sales engineer (offices in principal cities), or write Industrial Molded Products Division, C-D-F, Newark, Delaware.

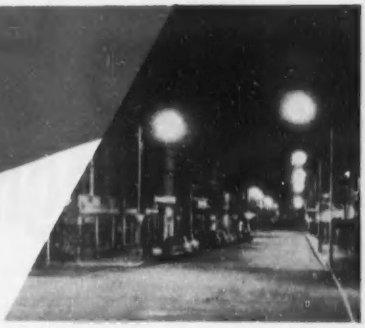
Here's a sample of the fine detail, finish, smoothness you can get with a C-D-F molded job. Edges and holes are clean cut, with a minimum of flash removal required.

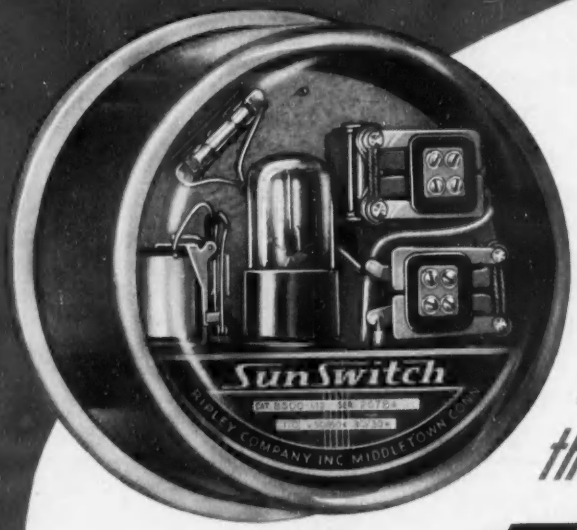
Still another C-D-F low cost molded product . . . made from macerated paper and phenolic resins. It's a "pot-eye" for the textile bleaching industry . . . cloth is run through the ring at high speed. Smooth, strong, never corrodes, withstands high heat and moisture and is very abrasive resistant.

THE NAME TO REMEMBER . . . C-D-F **INDUSTRIAL MOLDED PRODUCTS**

Continental-Diamond Fibre Company **NEWARK 15, DELAWARE**

RIPLEY





pioneers in street light controls since 1936 now feature the new

tested and proved

"double-duty 60" SUNSWITCH PHOTOELECTRIC CONTROL

With the introduction of the SUNSWITCH "double-duty 60", the Ripley Company has again demonstrated proof of its 18 year leadership in the field of photoelectric Street-Lighting Controls.

This economically installed and maintained 60-ampere SUNSWITCH is setting new standards of dependable performance and reliability.

When lights are needed . . . regardless of time of day, season or weather conditions . . . Ripley SUNSWITCH takes over — providing safe, dependable Street Lighting — *automatically.*

These are sound reasons why it is always good business to call in Ripley when Street-Lighting Controls are under consideration.

For the complete story with engineering data, write for Bulletin S-60.

RIPLEY
ESTABLISHED 1936

Superior . . . through Research

RIPLEY COMPANY, INC., MIDDLETOWN, CONN.

Recognized Service

The Electric Power Industry is recognized for its unselfish service to the public and to the communities which it serves. Dependable, uninterrupted electrical service, though often taken for granted can only be sustained through eternal vigilance and a wise and critical selection of all components entering the electrical system. Porcelain Products... proud of the part it plays in serving the Electric Power Industry through hundreds of individual power companies, many of which are recorded here*—dedicates itself to supplying the Industry with quality insulators and accessories at all times.

*Space does not permit the listing of all companies which we serve.

Houston Lighting & Power Company • Manilla Electric Company • Louisville Gas & Electric Co. • Detroit Edison Company • South Carolina Electric & Gas Co. • Memphis Light, Gas & Water Div. • Tucson Gas, Electric Light & Power Co. • Southern Utah Power Company • Oklahoma Gas & Electric Company • Delaware Power & Light Company • Missouri Power & Light Company • Potomac Electric Power Company • Northwestern Public Service Co. • Northern States Power Company • White Mountain Power Company • Public Service Electric & Gas Co. • Iowa Electric Light & Power Co. • Central Ohio Light & Power Co. • Kentucky Utilities Company • Atlantic City Electric Company • Florida Power & Light Company • Iowa Southern Utilities Company • Missouri Public Service Corp. • Toledo Edison Company • Monongahela Power Company • Arkansas Power & Light Company • Appalachian Electric Power Co. • Southwestern Public Service Co. • Gulf States Utilities Company • Pennsylvania Power Company • Pennsylvania Electric Company • Carolina Power & Light Company • Florida Power Corp. • Metropolitan Edison Company • New York State Electric & Gas Co. • Philadelphia Electric Company • Puerto Rico Water Resources Authority • Iowa Power & Light Company • Eastern Kansas Utilities • Kansas Gas & Electric Co. • Gulf Public Service Co. • Green Mountain Power Corp. • Pennsylvania Power & Light Co. • Idaho Power Co. • Montana Power Co. • Virginia Electric & Power Co. • Cincinnati Gas & Electric Co. • Montana-Dakota Utilities • Bangor Hydro Electric • Ohio Edison Co. • Minnesota Power & Light Co. • Louisiana Power & Light Co. • Staten Island Edison Corp. • Long Island Lighting Co. • Wisconsin Public Service Corp. • Central Illinois Elec. & Gas Co. • Western Light & Telephone Co., Inc. • Frontier Power Co. • Hawaiian Electric Company • Georgia Power & Light Company • Lake Superior District Power Co. • Southern Indiana Gas & Electric Co. • Stone & Webster.

A COMPLETE LINE OF TRANSMISSION AND DISTRIBUTION INSULATORS AND ACCESSORIES FOR ELECTRIC UTILITIES

YOUR INDEPENDENT INSULATOR MANUFACTURER

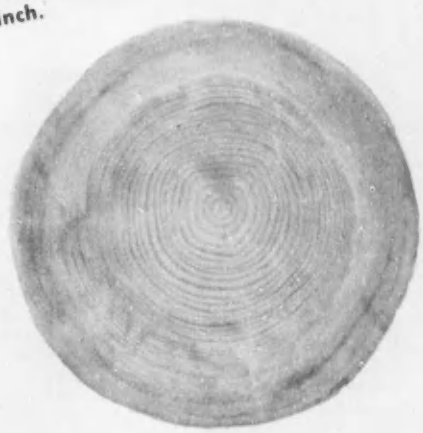
Porcelain Products, Inc.

PARKERSBURG, W. VA.

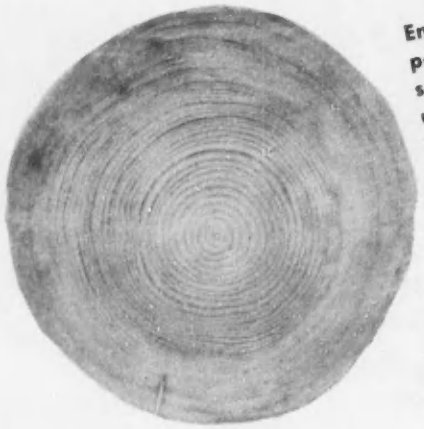
The Inside Story

OF LODGEPOLE PINE STRENGTH

It takes 80 to 160 years to grow a Lodgepole Pine tree to pole size. This slow, uniform growth results in a dependable product whose accepted strength rating is 6600 pounds per square inch.



Dependability results from slow, uniform growth shown in these unretouched photographs of Lodgepole ring structure. Rings average 20 to 30 per inch.



Engineers are saying that Lodgepole Pine is ideal for pole and spar arm use. Strength, based upon uniform growth, is one of the reasons for Lodgepole's long mechanical life.

PENTA and creosote-treated "Double-Life" Lodgepole crossarms and poles are available from our Libby plant. Literature and other information gladly furnished.

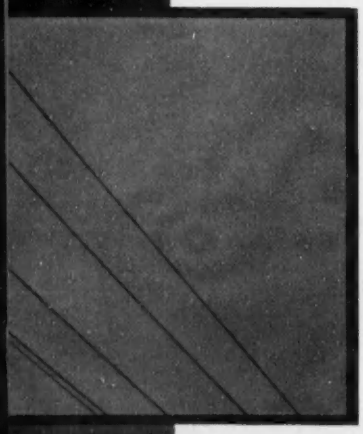
J. Neils Lumber Company

POLE DIVISION: LIBBY, MONTANA

D

What other capacitor in the field has stood up so well under the transient over-voltage conditions created by lightning? Or, can point to such a record of continuous trouble-free service year after year? Over 4,000 time-tested Cornell-Dubilier capacitor installations have proved that these are, without question, the most consistently dependable power-factor capacitors.

TEST



Behind this unsurpassed field performance record is C-D's superior design that builds into every C-D capacitor that extra margin of safety. These built-in extras mean lower volts per mil unit stress, lowest volt-ampere per square inch of radiating surface and the highest major insulation level.

As the final safeguard to assure you of maximum value for your capacitor dollar, only C-D pre-delivery quality tests every capacitor at its full rated voltage. We'll be glad to point out initial investment savings and year after year operating economy possible with a C-D capacitor installation. Cornell-Dubilier Electric Corporation, Dept. D-14, South Plainfield, New Jersey.

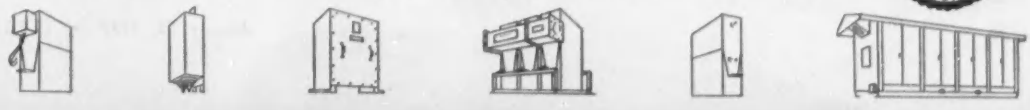
ONSISTENTLY EPENDABLE

CORNELL-DUBILIER CAPACITORS

FOR POWER-FACTOR IMPROVEMENT

PLANTS IN SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND FUQUAY SPRINGS, N. C.; SUBSIDIARY: THE RADIART CORPORATION, CLEVELAND, O.

THERE ARE MORE C-D CAPACITORS IN USE TODAY THAN ANY OTHER MAKE



As never before...

Today we are all aware of the disastrous and far-reaching effects of a major industrial fire. Owners . . . management . . . employees . . . customers . . . almost every one suffers, in one way or another, when a serious fire strikes.

Could it happen to your plant? Now is the time to take a long, close look at your plant's fire protection measures. Remember, the local fire protection ordinances normally only set minimum standards. Compliance with these ordinances is no guarantee of fully adequate firesafety.

One way to be absolutely sure of the efficiency of your plant's fire protection facilities is to call in an expert C-O-TWO Fire Protection Engineer. He is ready and willing to help you with any or all industrial fire hazard problems.

There is a personal sense of responsibility inherent with C-O-TWO Fire Protection Engineers that assures you of fully adequate firesafety . . . a definite plus in your behalf. Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . C-O-TWO means top quality backed by experienced engineering that results in operating superiority for you at all times.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-in High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-in Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY

C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

Sales and Service in the Principal Cities of United States and Canada

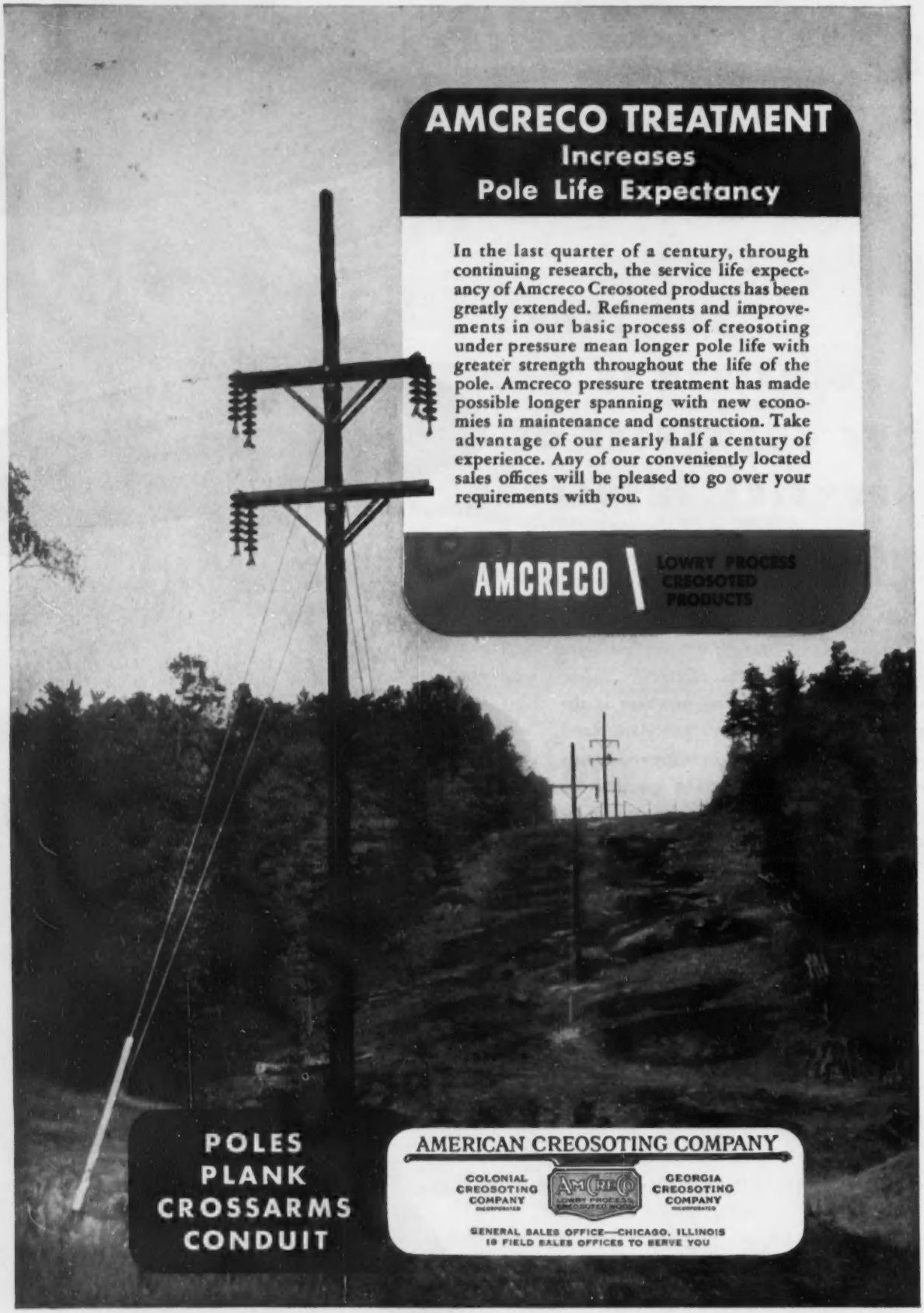
AFFILIATED WITH PYRENE MANUFACTURING COMPANY

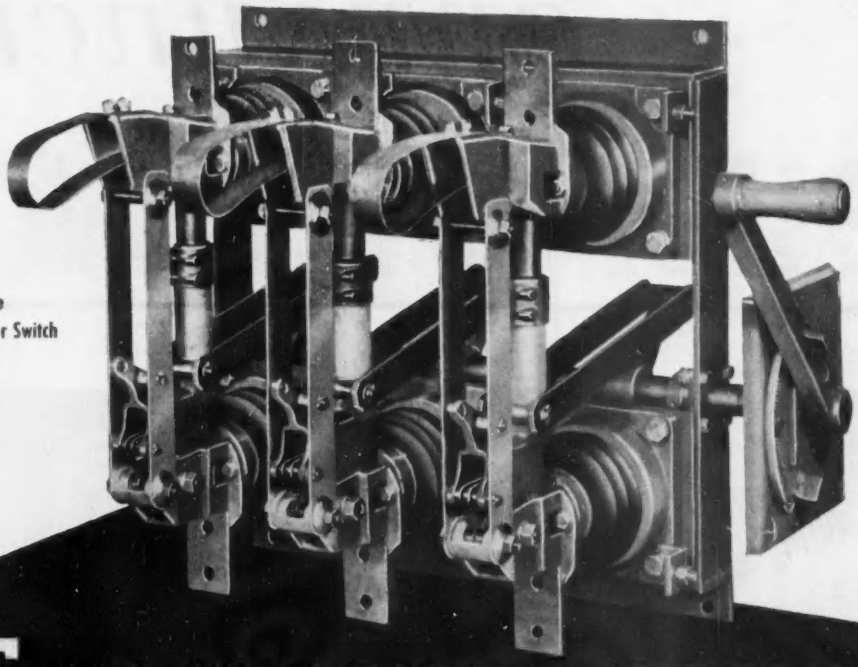
IT'S THE PORCELAIN THAT INSULATES

...AND LAPP PORCELAIN IS YOUR GUARANTEE OF SUSPENSION INSULATOR QUALITY

Lapp is the maker of porcelain insulators and insulating components which provide *an extra margin of operating security . . . long life . . . low upkeep and maintenance.* And nowhere is the importance of "Lapp quality" porcelain (and Lapp assembly) greater than in suspension units for transmission line duty . . . The specification *"Lapp Suspension Insulators"* is low premium insurance of long trouble-free service for your lines. Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp


AMCRECO TREATMENT
Increases
Pole Life Expectancy
In the last quarter of a century, through continuing research, the service life expectancy of Amcreco Creosoted products has been greatly extended. Refinements and improvements in our basic process of creosoting under pressure mean longer pole life with greater strength throughout the life of the pole. Amcreco pressure treatment has made possible longer spanning with new economies in maintenance and construction. Take advantage of our nearly half a century of experience. Any of our conveniently located sales offices will be pleased to go over your requirements with you.
AMCRECO
LOWRY PROCESS CREOSOTED PRODUCTS
POLES
PLANK
CROSSARMS
CONDUIT
AMERICAN CREOSOTING COMPANY
COLONIAL CREOSOTING COMPANY
GEORGIA CREOSOTING COMPANY
GENERAL SALES OFFICE—CHICAGO, ILLINOIS
10 FIELD SALES OFFICES TO SERVE YOU



3 P.S.T. 400 Ampere
5 KV. Air Interrupter Switch

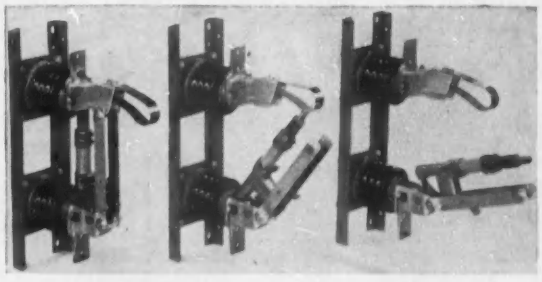
3E AIR INTERRUPTER SWITCHES

...Maximum Efficiency for 5 Basic Switching Jobs

1. **Interrupting magnetizing currents of transformers.**
2. **Interrupting charging current of lines and busses.**
3. **Interrupting exciting current of feeder regulators.**
4. **Interrupting load currents to rated capacity.**
5. **Sectionalizing feeders and distribution circuits.**

Costing less than circuit breakers, and with the interrupting capacity not found in air break disconnects, the Three E Air Interrupter Switch is ideal for these intermediate jobs. Combined with power fuses, they offer full circuit protection where automatic restoration of service is not required. The dry type interrupter unit generates gas blasts to confine and extinguish arcs. Operation is fast, clean and efficient.

Available from 5 to 15 KV. and 400 to 600 amperes.



OPERATING SEQUENCE

As the blade starts to open the upper end of the interrupter unit engages the auxiliary contact completing circuit thru interrupter. The blade then shunts *all* current thru the interrupter (center figure). The spring mechanism trips, breaking the circuit wholly within the interrupter. Closure reverses the procedure. With the Three E, making and breaking the circuit is always done *inside* the interrupter unit and never by the blades and clips.

Ask for Bulletin 142

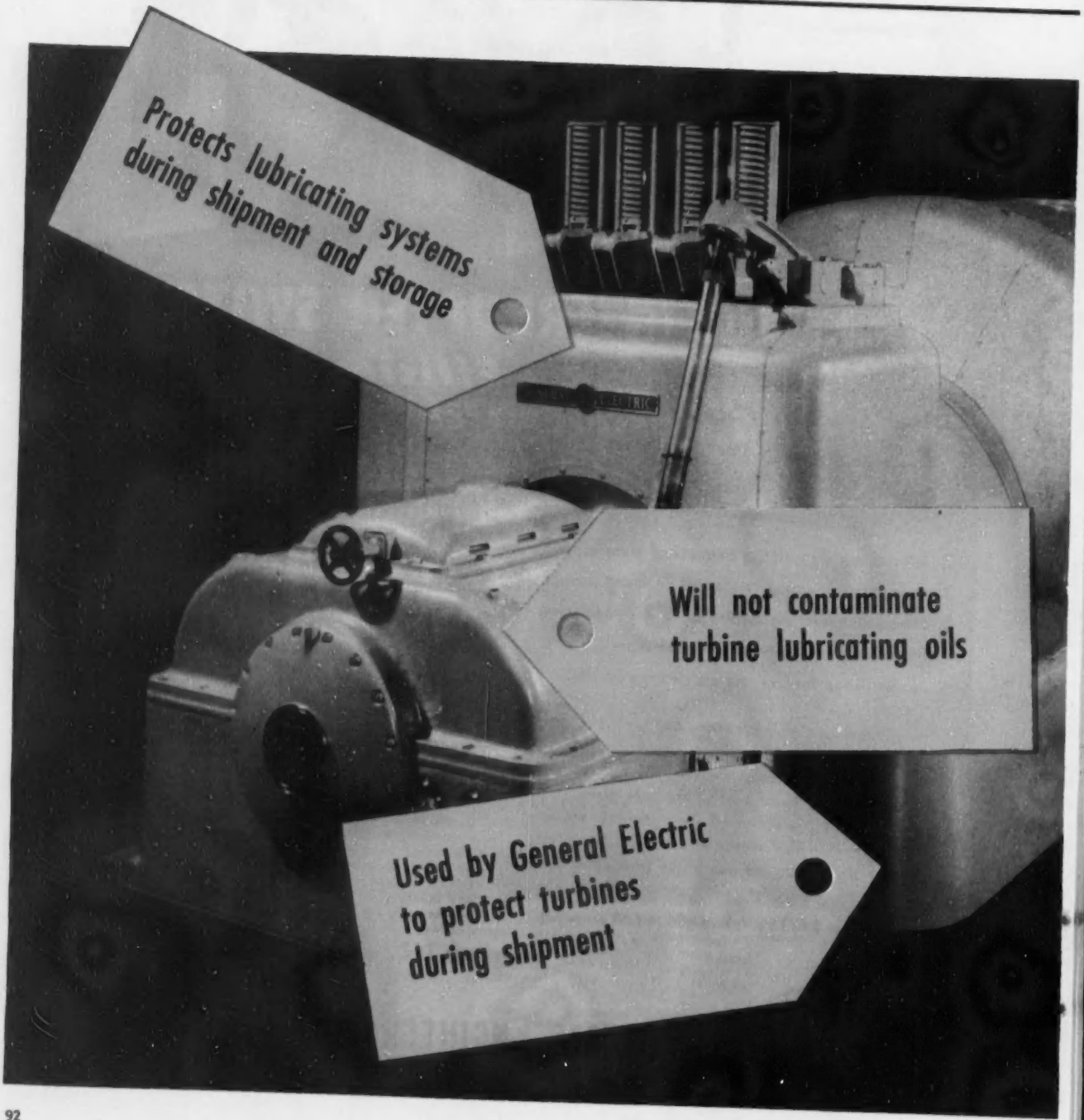
THREE E — ELECTRICAL ENGINEERS EQUIPMENT CO. — MELROSE PARK, ILL. U.S.A.

ELECTRICAL ENGINEERS EQUIPMENT CO.

Melrose Park, Illinois

announcing

GULF OILCOAT T


Protects lubricating systems during shipment and storage
Will not contaminate turbine lubricating oils
Used by General Electric to protect turbines during shipment

the ideal turbine rust preventive

Now—an effective turbine rust preventive that is non-oil contaminating!

Gulf Oilcoat T—the latest development of Gulf Research Laboratories—in addition to protecting turbine lubricating systems from rust during shipment and storage, will not contaminate turbine lubricating oils. This compatibility with lubricating oils is of paramount importance if your turbine system is flushed with the same oil that is to be used for lubrication.

General Electric Company, after comprehensive testing, has established Gulf Oilcoat T as an effective rust preventive and is using it in G-E turbines.

Because of its light viscosity this new product may be sprayed on metal surfaces, or it may be applied by dipping or brushing.

Although developed primarily for protecting turbine lubricating systems, Gulf Oilcoat T also prevents corrosion on other types of machinery during extended shutdowns.

GULF SERVES INDUSTRY

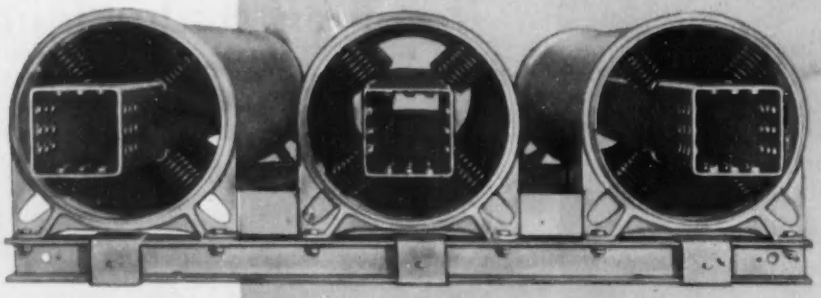
Gulf Oil Corporation
Gulf Refining Company
1822 Gulf Building
Pittsburgh 30, Pa.

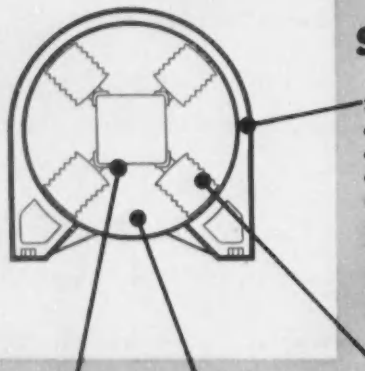
support Junior Achievement

What Isolated Phase Bus is

Transmitting huge quantities of electrical energy at generated voltage is a job for an especially reliable type of conductor. Generator leads, transformer leads, feeders, and main and transfer buses in generating and distribution stations form key links in the nation's power networks. They must possess high dielectric and mechanical strength.

I-T-E Isolated Phase Bus is designed to meet all these electrical and mechanical essentials. It is a structure of heavy copper conductors, one to a phase, each enclosed in its own grounded metal shield. This basic design characteristic completely eliminates phase-to-phase faults in the most economical way possible.





Simplicity is the keynote

SUPPORTING RINGS of strong cast aluminum connect the light metal cover electrically and mechanically to grounded plant steelwork. Tightly gasketed aluminum covers make a single design suitable for indoor or outdoor use.

CONDUCTORS— one for each phase— are of copper or aluminum in round or square cross-section. Lengths up to twenty-four feet are joined end to end with solid, flexible, or braided connectors.

AIR SPACE insulation is unchanged by heat or age. Because air is free and inexhaustible, it does not have to be replenished or kept under pressure.

INSULATORS are of solid, non-aging porcelain, radially disposed to withstand compression. Insulators cradle conductors to allow free movement when conductors expand or contract.

The construction of I-T-E Isolated Phase Bus is as simple as its neat appearance suggests. Complete phase isolation—the fundamental requirement—is achieved through the arrangement and construction of conductor, insulator, and housing.

Light weight, freedom of movement for conductors, adequate cooling, and other requirements are provided for through use of a few simple parts.

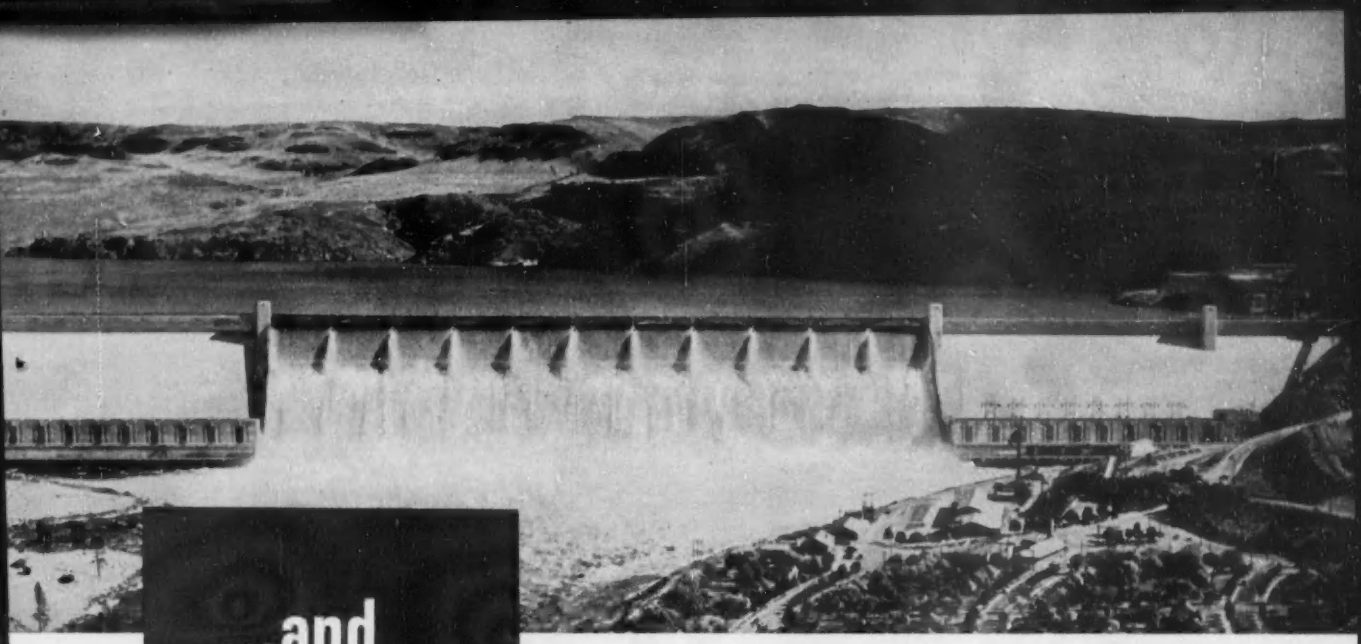
For details, check the I-T-E Application Engineer nearest you.

I-T-E

ISOLATED PHASE BUS

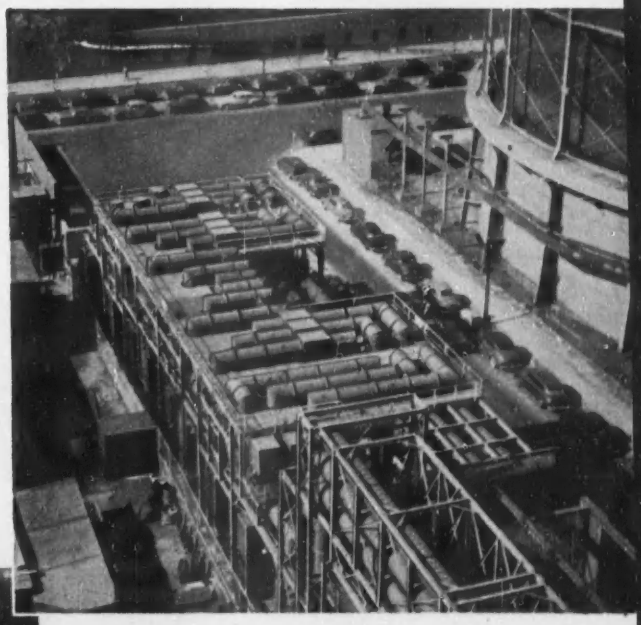
I-T-E CIRCUIT BREAKER CO. • 19th and HAMILTON STS. • PHILA. 30, PA.

R&IE EQUIPMENT DIVISION, GREENSBURG, PA.

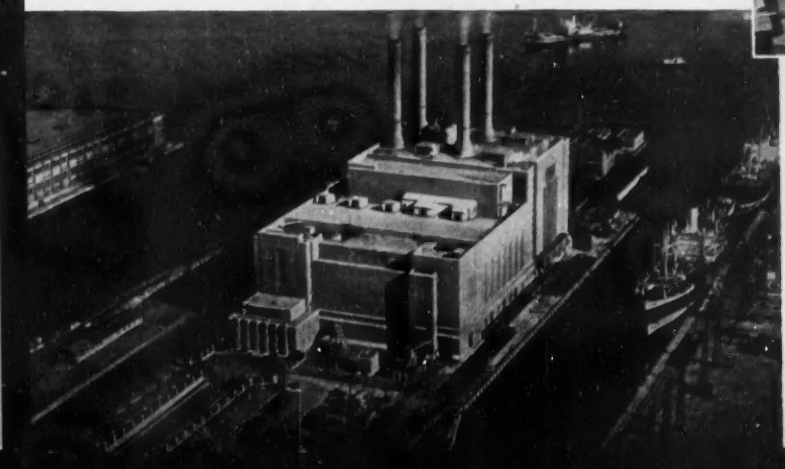


...and where it is used

Hydroelectric generators—
including the world's largest waterwheel-driven machines, deliver vast quantities of power through safe I-T-E Isolated Phase Bus runs.



Steam plants—
are being built with larger and larger generators. I-T-E has design experience and production facilities to keep pace with the nation's expected power expansion and with rapid increases in generator output ratings.



Switching stations—
of the most modern types use I-T-E Isolated Phase Bus runs to connect transformers and distribution switchgear. The installation pictured here employs 69-KV bus structures at a utility central station.

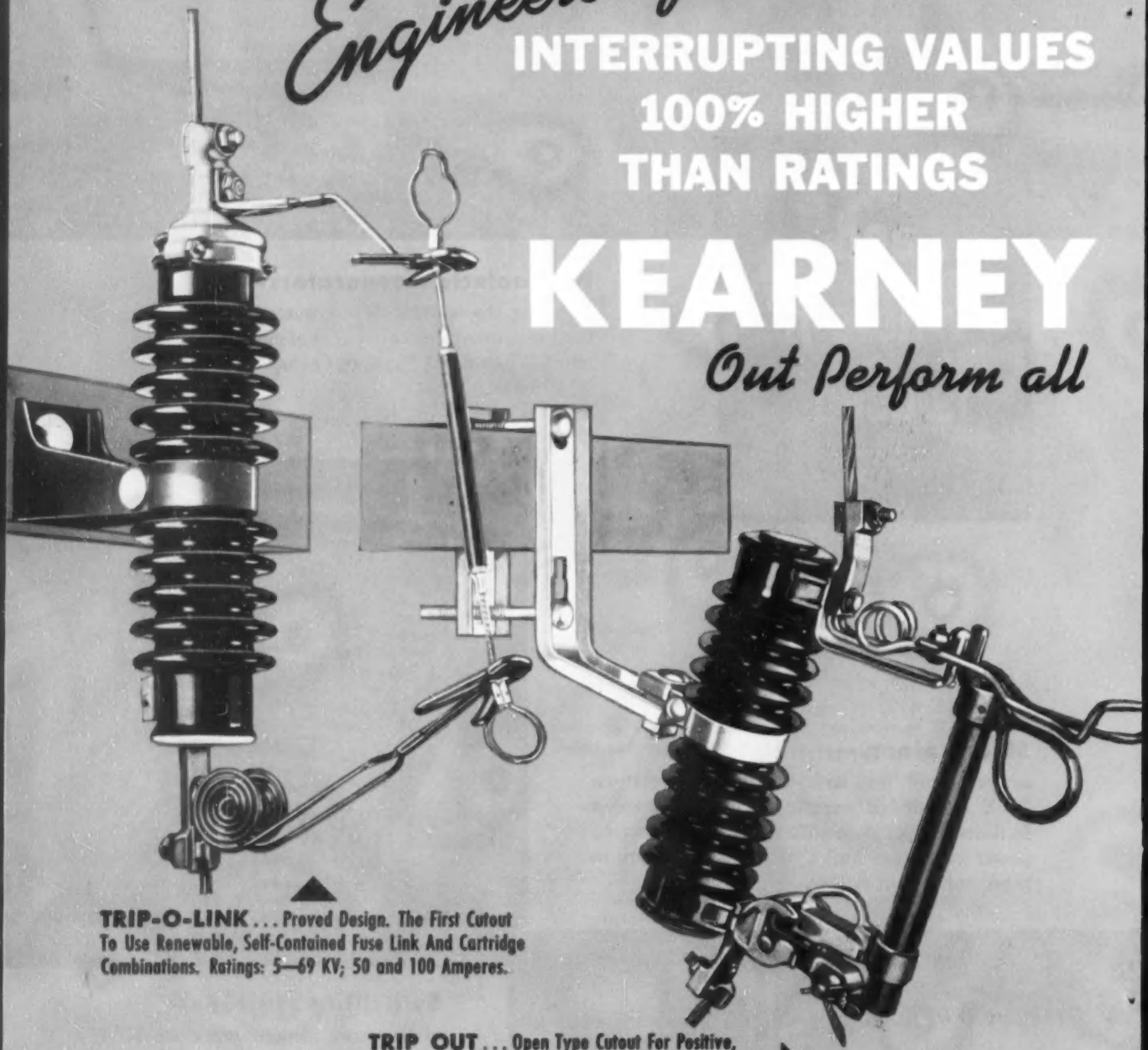
4 Leaders in the Field of PRIMARY PROTECTION

Engineered for

INTERRUPTING VALUES 100% HIGHER THAN RATINGS

KEARNEY

Out Perform all



TRIP-O-LINK . . . Proved Design. The First Cutout To Use Renewable, Self-Contained Fuse Link And Cartridge Combinations. Ratings: 5—69 KV; 50 and 100 Amperes.

TRIP OUT . . . Open Type Cutout For Positive, All-Weather Performance At Sustained, Full-Rated Load. Ratings: 5—69 KV; 100 and 200 Amperes.

Specify **KEARNEY PRODUCTS**

FOR BETTER CONSTRUCTION • SAFER MAINTENANCE

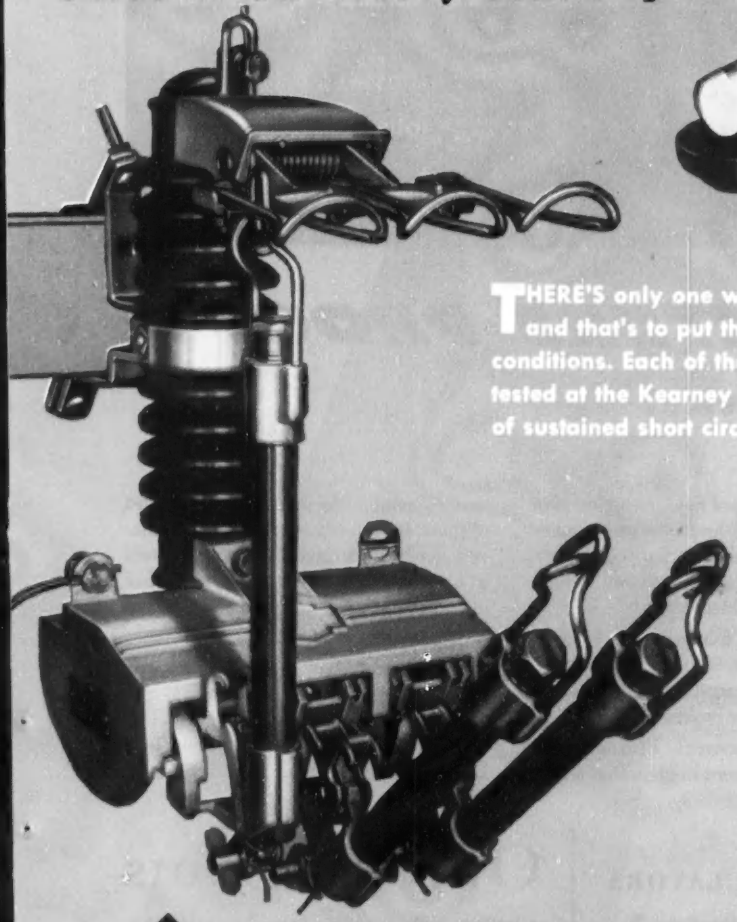
HAVE YOU added substation capacity recently? Chances are you have because load density is growing fast. Then ask yourself this question. Will present fuse cutouts on my distribution system interrupt the heavier fault current? If the nameplates say "KEARNEY" . . . then the answer is "YES."

Feeder outages in 5 years will be even more costly, more damaging than they are now. Kearney field-trained engineers know first hand how important it is to isolate faults; how much they can cost in time, money and customer ill will. That's why Kearney Fuse Cutouts have been designed to clear shorts far heavier than present NEMA standards require. And remember . . . this extra interrupting capacity costs you no more than ordinary cutouts designed for present loads only!

fuse CUTOUTS

others in the Power Field

TRIP O MATIC
Enclosed Type Cutout. Full Range Fault Protection For Urban Systems. Ratings: 5 and 7.5 KV; 50 and 100 Amperes.



TRIPSAVER . . . Three Shot Reclosing Type Cutout. Provides Service Continuity On Troublesome Circuits. Ratings: 7.5—34.5 KV; 100 and 200 Amperes.

THERE'S only one way to check up on field performance . . . and that's to put the cutout into service under exact operating conditions. Each of the 4 fuse cutouts illustrated has been thoroughly tested at the Kearney Sub-Station Laboratory, where 445,000 Kva of sustained short circuit energy are available line to line. Each has proved itself to have the extra interrupting capacity needed to clear increased fault currents.

Then, too, operating records from utilities the country over prove that Kearney cutouts give trouble-free performance in every type of climate, in every type of corrosive atmosphere. At least 15 years of on-the-line service stand behind each of these leaders in primary protection. Take advantage of this proved record.

Be ready for tomorrow . . .
Specify Kearney Today!

JAMES R. KEARNEY CORPORATION
4224-42 CLAYTON AVE. • SAINT LOUIS 10, MO.
Canadian Plant: Guelph, Ontario

THEY'RE PUNCTURE PROOF!

If it's on the pin, it's in service!

No more searching for defective insulators when your lines are protected with NEW Kimble *Tempered* Glass Insulators.

Why? Because these new insulators are puncture-proof. Exhaustive laboratory tests at values far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air—*even under voltage impulses far above normal service rating*. Four years of field testing on more than 500 miles of line have produced no puncture failures. Even lightning surges have failed to damage these new Kimble *Tempered* Glass Insulators.

In the event of shattering due to severe mechanical shock, insulator disintegrates into small non-sharp fragments. Trouble shooters can locate broken insulator—fast.

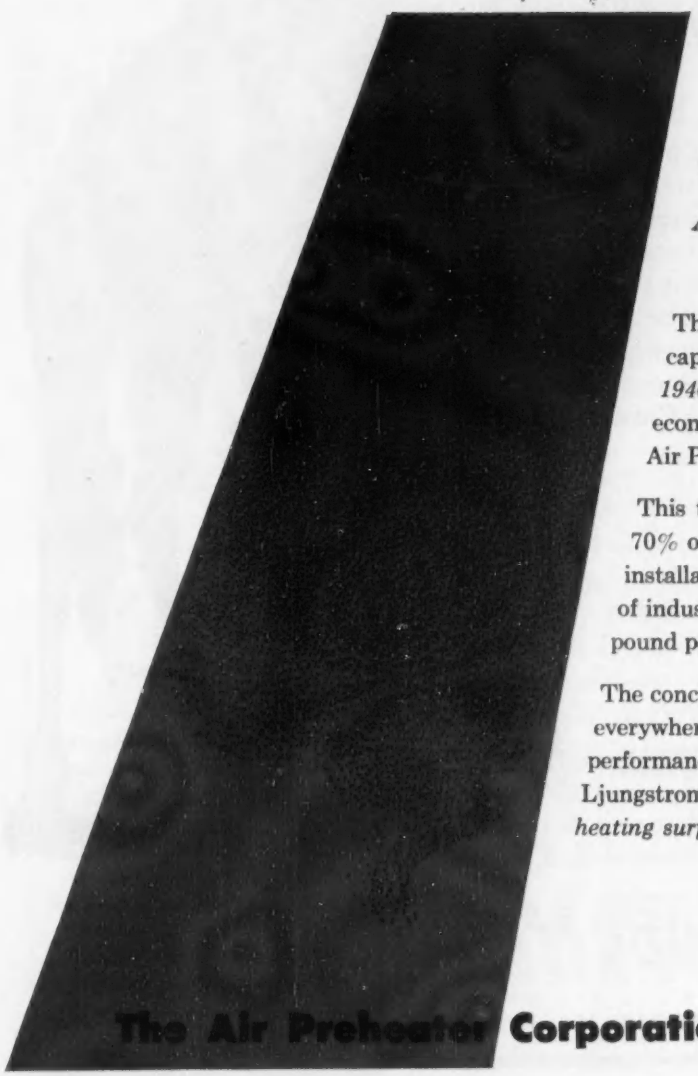
What's the secret? *Tempering*, a Kimble development-in-glass that adds a new element to the many natural virtues of glass. It's an exclusive Kimble production method that gives Kimble insulators a hard-compression surface layer that makes them strong enough to meet the severe tests required.

Why not see how *tempered* glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, Dept. EW1, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

420,000,000 pounds of steam per hour



served by

LJUNGSTROM

Air Preheaters

That's the amount of new steam capacity, installed or on order *since 1946 alone*, designed to utilize the economies available with the Ljungstrom Air Preheater.

This total capacity includes nearly 70% of all new central station boiler installations, as well as the major portion of industrial boilers in the over-250,000 pound per hour range.

The conclusion is obvious: Boiler users everywhere realize that the fuel-saving, performance-boosting abilities of the Ljungstrom make it the *most economical heating surface on the modern boiler.*

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

HIGH-LEVEL PERFORMANCE

THANKS TO BATTERY POWER!

Emergencies never become crises when you've got Gould Plantés in your battery room. These Aristocrats of Stationary Batteries have PURE LEAD positive plates that constantly renew the active material throughout their life. *These batteries last practically forever!* The high-level performance and extra years you get with Gould Plantés make them the lowest cost stand-by batteries you can buy! *Standardize* on *Gould Planté!*

Specify
GOULD PLANTÉ—
The Aristocrat of Stationary Batteries

GOULD INDUSTRIAL BATTERIES

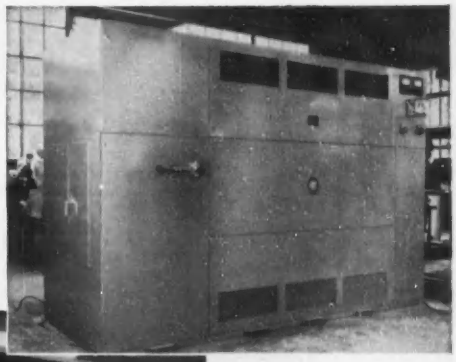
GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

©1953 Gould-National Batteries, Inc.

MARCUS dry type TRANSFORMERS

are insulated with NATVAR SPECIAL INSULATION



This trim, compact cabinet houses a Marcus 2000 kva., 4800-480 volt, 3 phase, 60 cycle, dry-type transformer which will supply intermediate AC power to a bank of selenium rectifiers in a large West Coast metal reduction plant.

This interior view shows the rugged construction of Marcus industrial unit substations. A Natvar special combination of Quinorgo® firmly bonded to varnished open-weave Fiberglas provides a flexible insulation of high dielectric strength and great mechanical toughness, plus the ability to withstand continuously high operating temperatures. It is used as a layer insulation for the major insulation barrier between primary and secondary, and between core and coils.

Marcus Transformer Co., Inc., Hillside, N. J. manufactures dry-type transformers from 1 to 3000 kva. capacity, engineered for long life and continuous, trouble-free service.

All materials used in their construction are carefully chosen for durability and performance under maximum loads at high temperatures. A Natvar special combination of Quinorgo® and Fiberglas firmly bonded together is used because of its exceptionally good electrical properties, flexibility, mechanical strength, and its ability to withstand heat.

Whether your requirements call for a standard insulating material, available either from your wholesaler's stock or direct from our own, or a special combination, it will pay you to investigate Natvar flexible insulations.

Natvar

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Varnished-lacquered tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 22

NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE RAHWAY 7-8800 — CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

For a combination of

GOOD CONDUCTIVITY
RESISTANCE TO STICKING
RESISTANCE TO ARC EROSION
IMPACT STRENGTH

ELKONITE® CONTACTS have no equivalent

The secret of Elkonite superiority for heavy duty circuit interrupting equipment is in its physical structure . . . the way in which the desirable properties of each constituent metal are retained to a high degree in the final composite material.

An exclusive Mallory process combines the high melting points of tungsten, molybdenum, or their carbides, with the current-carrying ability of silver and copper in a way that has never been equalled. As a result, no contact material can match Elkonite in all four features that spell top performance . . . conductivity, impact strength, resistance to arc erosion and sticking.

To builders of circuit breakers and switch gear of any rating, Mallory offers a quarter century of specialized contact experience and a complete family of contact materials. Only by specifying Mallory Elkonite can you be sure of Elkonite dependability under all conditions.

➧ Write for your copy of the new Mallory Contact Catalog. It includes a discussion of all Mallory alloys and facilities for producing contacts and contact assemblies for every service.

Expect more...Get more from MALLORY

Serving Industry with These Products:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P. R. MALLORY & CO. Inc.
MALLORY
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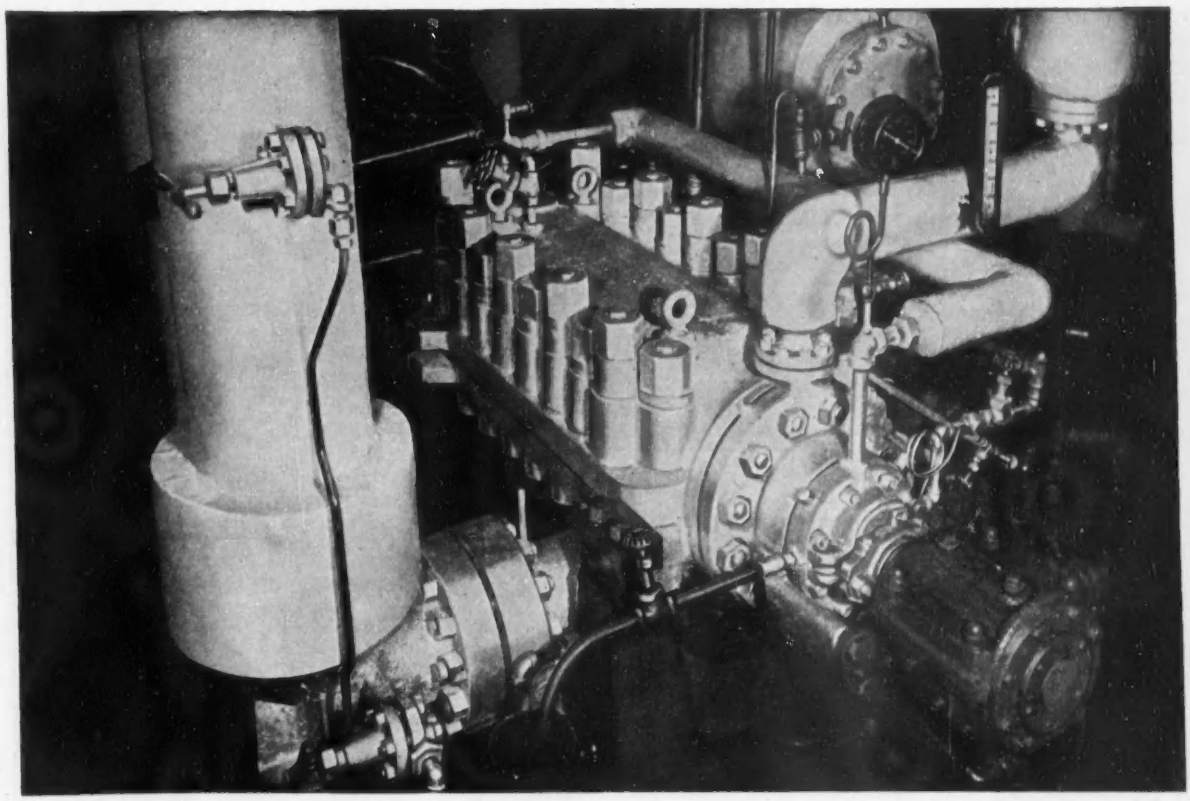
100,000 HOURS

and not opened yet!



This Ingersoll-Rand High Pressure Boiler Feed Pump installed 15 years ago has never been opened for inspection . . . and it still meets capacity and pressure requirements.

The Ingersoll-Rand Class HT pump shown above was installed in 1938 at the Windsor Station, owned jointly by The Ohio Power Company (part of the American Gas & Electric Company) and the West Penn Power Company (in the West Penn Electric Company system). Since that time, it has operated for over 100,000 hours—pumping 1025 gpm of 380° F boiler feed water at 415 psi intake and 1900 psi discharge. Throughout this entire 15 year period, the casing and high pressure breakdown have never been opened for inspection.

There are five other I-R Class HT pumps at this station. Four of these have chalked up unopened service records of from 50,000 to 80,000 hours each.

These outstanding operating records are the result of competent pump operation and feedwater control on the part of the station's personnel—and the careful material selection and high standards of construction inherent in every I-R boiler feed pump.

For *proved dependability* in high pressure service, it pays to specify Ingersoll-Rand pumps.

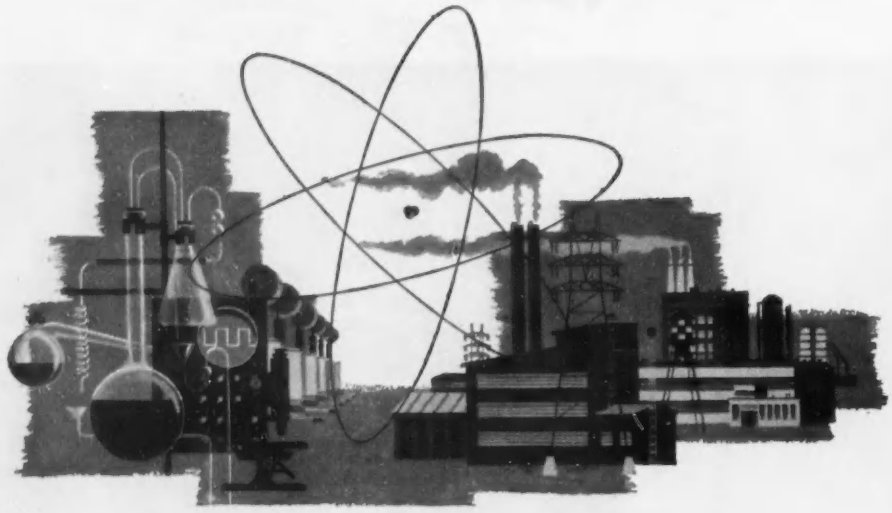
Ingersoll-Rand

Cameron Pump Division
11 Broadway, New York 4, N. Y.

948-10

ROCK DRILLS • COMPRESSORS • AIR & ELECTRIC TOOLS • VACUUM EQUIPMENT • PUMPS • GAS & DIESEL ENGINES

NORTH AMERICAN AVIATION
is ready to build



NUCLEAR REACTORS FOR SCIENCE AND INDUSTRY

North American Aviation is ready now to design and build nuclear reactors to fit the research and power production needs of any qualified educational, medical or industrial group.

As in the case of proposals now in process, North American will provide all engineering services necessary for reactor development and operation, offering the widest possible range of reactor application. North American is also prepared to supply accessory equipment . . . as well as a variety of services essential to the success of various atomic projects.

Through its work with the Atomic Energy Commission and other government agencies, North American has developed one of the most complete atomic research and production facilities to be found in private industry . . . staffed by one of the nation's largest groups of outstanding engineers and scientists.

North American invites your inquiry regarding reactor development or any other project in which atomic energy can be put to productive use. All reactor development is undertaken in accordance with the provisions of the Atomic Energy Act and subject to approval of the Atomic Energy Commission.

NORTH AMERICAN AVIATION, INC.

ATOMIC ENERGY RESEARCH DEPARTMENT • DOWNEY, CALIFORNIA

ON THE HIGH VOLTAGE HORIZON

The TTR49 AIR SWITCH

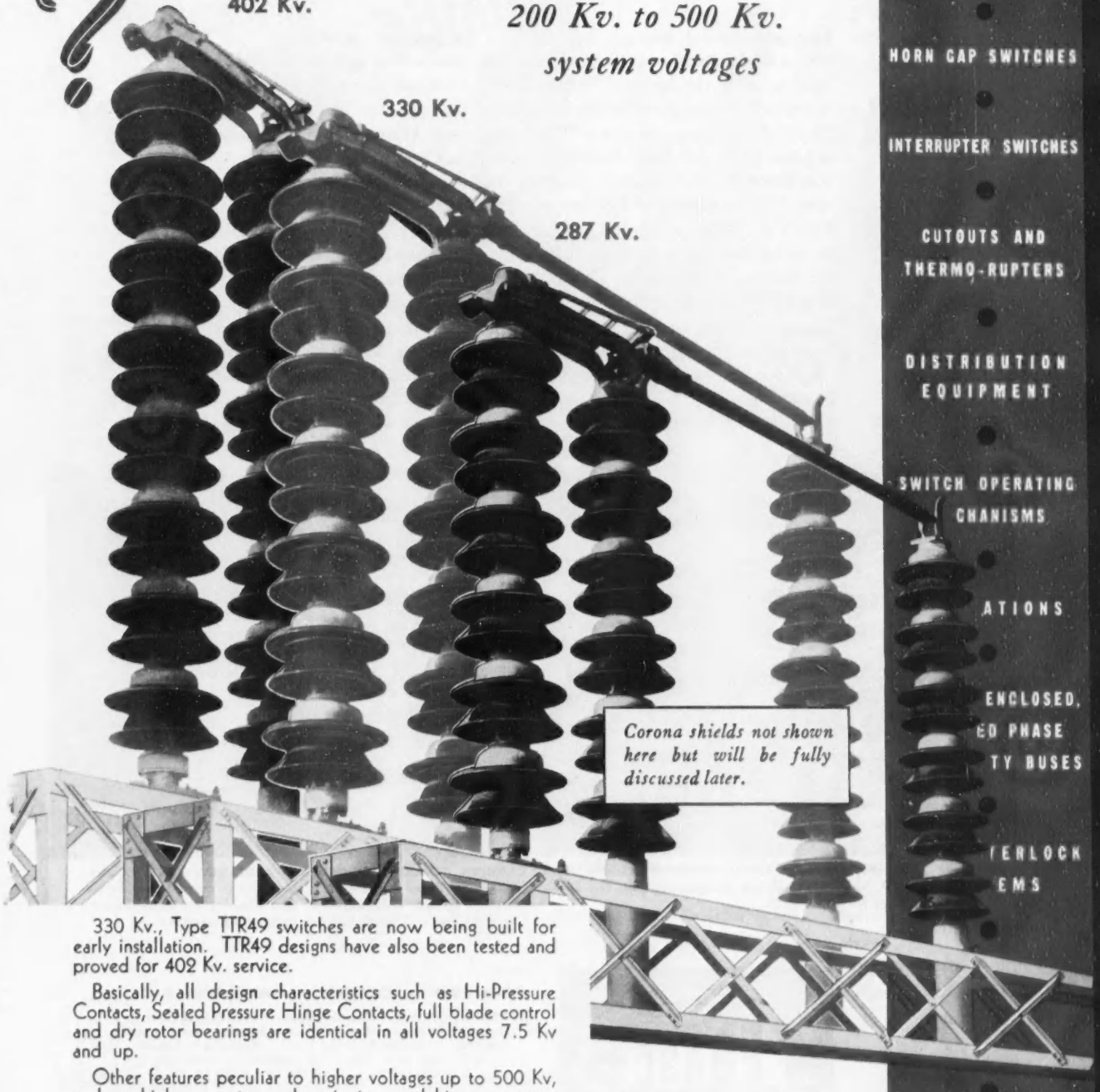
500 Kv.

402 Kv.

330 Kv.

287 Kv.

sets the pace for your future system for 200 Kv. to 500 Kv. system voltages



Corona shields not shown here but will be fully discussed later.

330 Kv., Type TTR49 switches are now being built for early installation. TTR49 designs have also been tested and proved for 402 Kv. service.

Basically, all design characteristics such as Hi-Pressure Contacts, Sealed Pressure Hinge Contacts, full blade control and dry rotor bearings are identical in all voltages 7.5 Kv and up.

Other features peculiar to higher voltages up to 500 Kv, such as high momentary values in jaw and hinge contacts, corona shielding, break distances, blade construction and balance, and interphase operating connections have been designed and tested for the ultra high voltages of the future.

R&IE

R&IE SWITCHING EQUIPMENT

DIVISION OF I-T-E CIRCUIT BREAKER CO., GREENSBURG, PA.

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING CHANISMS

ATIONS

ENCLOSED, ED PHASE TY BUSES

TERLOCK EMS

METAL CUBICLES

TESTING DEVICES

Northwest Rivers Sing a Song of New Power

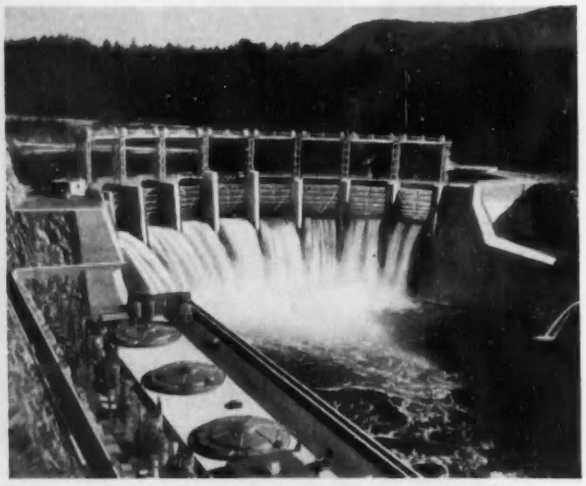
Late last summer, two new hydroelectric plants began generating power in the Northwest. Both demonstrate man's skill and ingenuity in harnessing the forces of Nature, and in each case the engineering and construction were handled by Ebasco.

The Cabinet Gorge project of The Washington Water Power Company is powered by the deep, swirling waters of the Clark Fork River which roar through Cabinet Gorge. Here an arch dam was constructed 200 feet high, stretching in a graceful 600-foot arc across the canyon.

The Yale Hydroelectric Plant of the Pacific Power & Light Company is one of the largest earth-fill dams and is operated by remote control from the Merwin Hydroelectric Plant, 14 miles downstream, which was engineered and constructed by Ebasco in 1931.

Ebasco provides a wide range of construction and consulting services to business and industry all over the world. They are described in our booklet, "The Inside Story of Outside Help." May we send you a copy? Write or phone Ebasco Services Inc., Dept. M, Two Rector Street, New York 6, N. Y.

PACIFIC POWER & LIGHT COMPANY'S 100,000 kilowatt Yale Hydroelectric Development on the Lewis River in Washington.



CABINET GORGE HYDROELECTRIC DEVELOPMENT on the Clark Fork River in northern Idaho, ¼ mile west of the Idaho-Montana border. This project of The Washington Water Power Company has a 200,000 kilowatt generating capacity.

ENGINEERS · CONSTRUCTORS
EBASCO
BUSINESS CONSULTANTS

NEW YORK • CHICAGO • WASHINGTON, D. C.

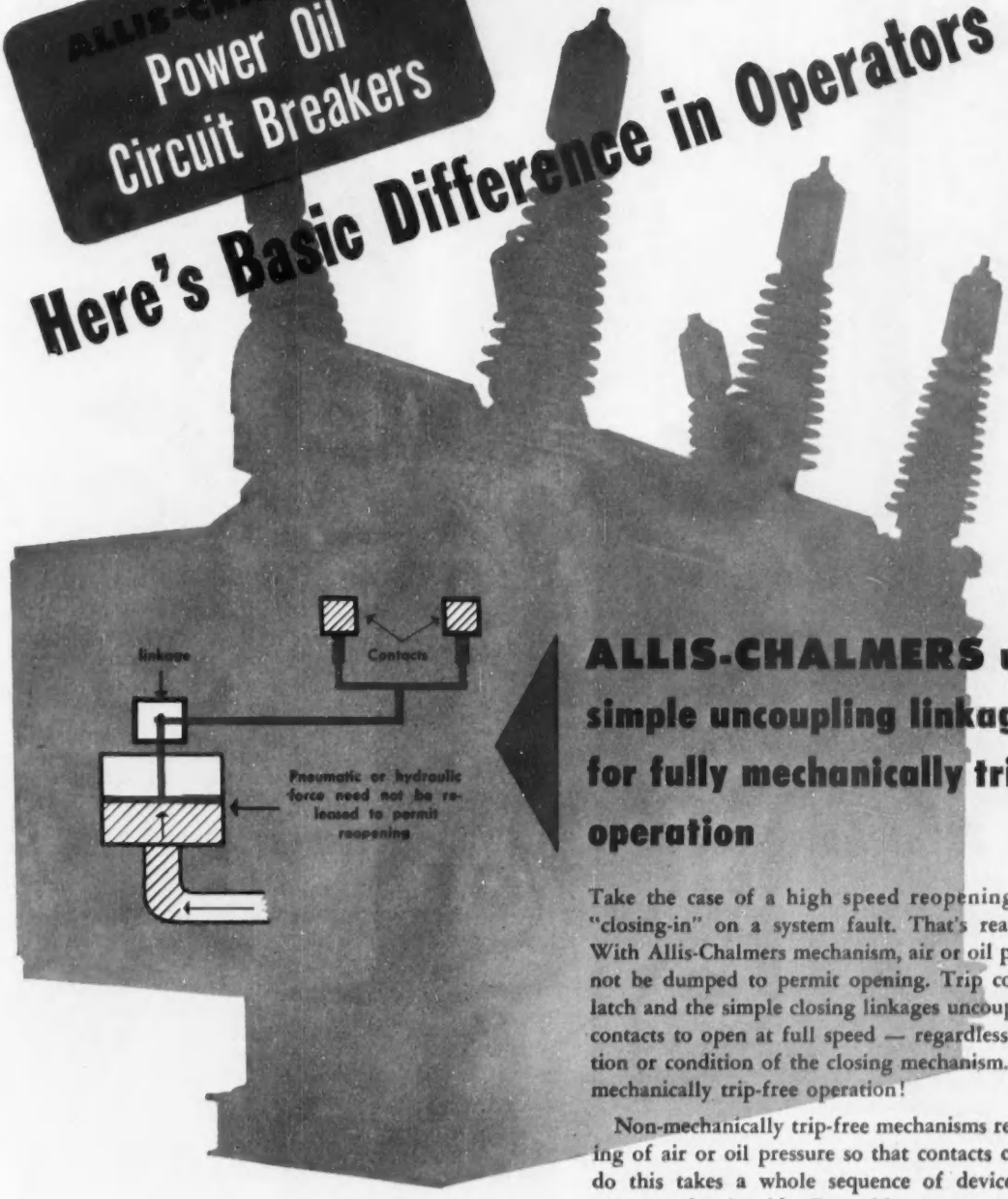
Appraisal · Budget · Business Studies · Consulting Engineering Design & Construction · Financial · Industrial Relations · Inspection & Expediting · Insurance, Pensions & Safety · Purchasing · Rates & Pricing · Research · Sales & Public Relations · Space Planning Systems & Methods · Tax · Traffic · Washington Office

Ebasco Teamwork gets things done anywhere in the world

ALLIS-CHALMERS

Power Oil Circuit Breakers

Here's Basic Difference in Operators



ALLIS-CHALMERS uses simple uncoupling linkage for fully mechanically trip-free operation

Take the case of a high speed reopening following "closing-in" on a system fault. That's really the test! With Allis-Chalmers mechanism, air or oil pressure need not be dumped to permit opening. Trip coil releases a latch and the simple closing linkages uncouple, allowing contacts to open at full speed — regardless of the position or condition of the closing mechanism. That's fully mechanically trip-free operation!

Non-mechanically trip-free mechanisms require dumping of air or oil pressure so that contacts can open. To do this takes a whole sequence of devices, including valves and solenoids. Everything must work perfectly, or breaker will be held closed or slowed in opening.

This truly simple operator principle has been a feature of Allis-Chalmers breakers since 1933. For further details call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4219

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Hotpoint

Has Built Acceptance for Electric Water Heaters

Hotpoint pioneered the electric water heater. The efficient performance and sales success of the Hotpoint water heater with Magic Circle® heat proved the advantages of heating water with electricity, and thus paved the way for the fine acceptance of electric water heaters . . . *now* there are almost 6,000,000 water heater customers on utility lines, *and*, this means steady, round-the-clock utility revenue, because the water heater load is balanced through off-peak hours.

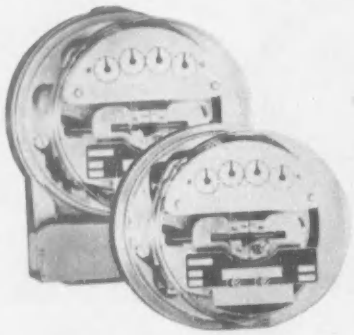
Nearly 2,000,000 units—about one-third of all water heaters in use today—were produced by Hotpoint. Hotpoint has a complete line to cover any domestic need . . . a full range of sizes in round and table-top models. Every unit has Hotpoint's industry-famed MAGIC CIRCLE® heat with Calrod® heating units. Water is heated by conduction, the most direct and rapid way, and water temperature is easily selected by dial.

Have your Hotpoint distributor give you the facts on the Hotpoint Electric Water Heaters. Learn today's opportunities PLUS the tremendous revenue potential for years and years to come.

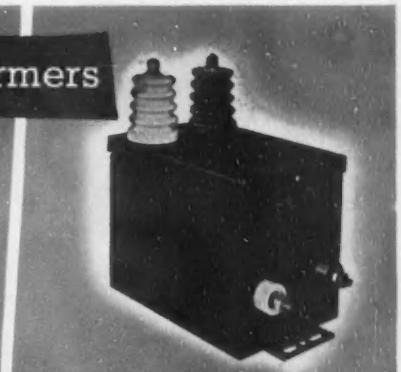
Again Hotpoint *looks at Tomorrow, Today*

HOTPOINT Co. (A Division of General Electric Company) 5600 West Taylor Street, Chicago 44, Illinois

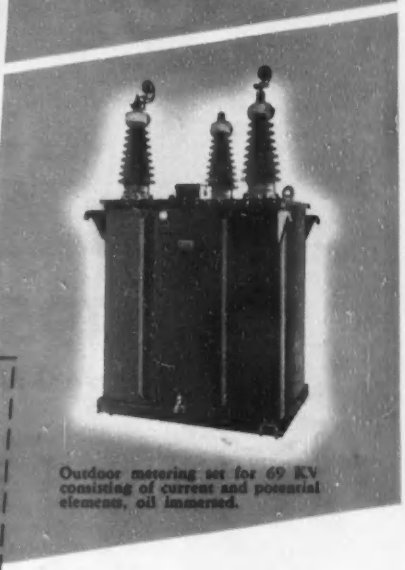
current, potential and metering transformers



Type NAS indoor current transformer. Primary current ratings of 200, 400 or 600 amperes. Capacity 25 volt amperes.



Indoor type unfused potential transformer 200 VA, 2400/120 volts, 60 KV FW impulse level.



Outdoor metering set for 69 KV consisting of current and potential elements, oil immersed.

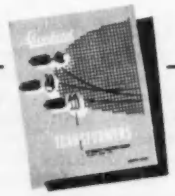
When accuracy is a factor

In the field of measurement for precision metering, operation of indicating instruments, relays and control apparatus, there is no substitute for accuracy.

The Standard Transformer Company has designed and is manufacturing a complete line of accurate current and potential transformers for every application... current, potential and metering transformers for any voltage up to and including 72 KV, and at any specified frequency. All thermal and mechanical ratings in accordance with industry's requirements and standards for each specific use. All standards set by ASA and EEI-NEMA in respect to accuracy are met.

Many prominent manufacturers of switchgear and control apparatus are regular users of STANDARD current and potential transformers. Our production facilities are flexible and engineering skill versatile enough to produce quickly transformers of special design to meet your specifications. Call in your STANDARD representative for further information.

everything points to



WRITE FOR BULLETIN S-501-B

32 pages of detailed drawings, accuracy limits, ratio and phase angle curves for current, potential and metering transformers. Write for your copy today.

Standard

THE STANDARD TRANSFORMER COMPANY

Trade Mark ®

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

New 1954 Chevrolet Trucks

New Power! New Economy! New Features you want!

New Chevrolet trucks for '54 are here to do your hauling or delivery job faster, more efficiently and more economically.

To begin with, they bring you thrifty new power in *all* models. You save time on every trip with extra reserves of high-compression horsepower under the hood—and you enjoy greatly increased operating economy as well.

In addition, these great new Chevrolet trucks offer new and even greater dependability with increased ruggedness throughout the chassis. You'll find heavier axle shafts in 2-ton models . . . bigger, more durable clutches in light- and heavy-duty models . . . more rigid frames in *all* models. Pickup and stake bodies are plenty rugged, too—and they're roomier for '54!

But that's only the beginning! You enjoy new cab comfort, convenience and safety. Instruments are easier to read . . . controls are easier to reach. A new one-piece curved windshield gives you greater visibility. The new Ride Control Seat* lets you drive in relaxed comfort hour after hour, over all kinds of roads. Seat cushion and back move as a unit to "float" you over bumps without back-rubbing.

In another great advance, new Chevrolet trucks offer you the last word in no-shift driving ease and convenience. With proved truck Hydra-Matic transmission* you can drive all day and make door-to-door deliveries without shifting or clutching. Fact is, there *is* no clutch!

These are some of the many big new benefits awaiting you in the new Chevrolet trucks for '54. Why not plan to get the whole money-saving story at your Chevrolet dealer's soon! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Most trustworthy trucks on any job!

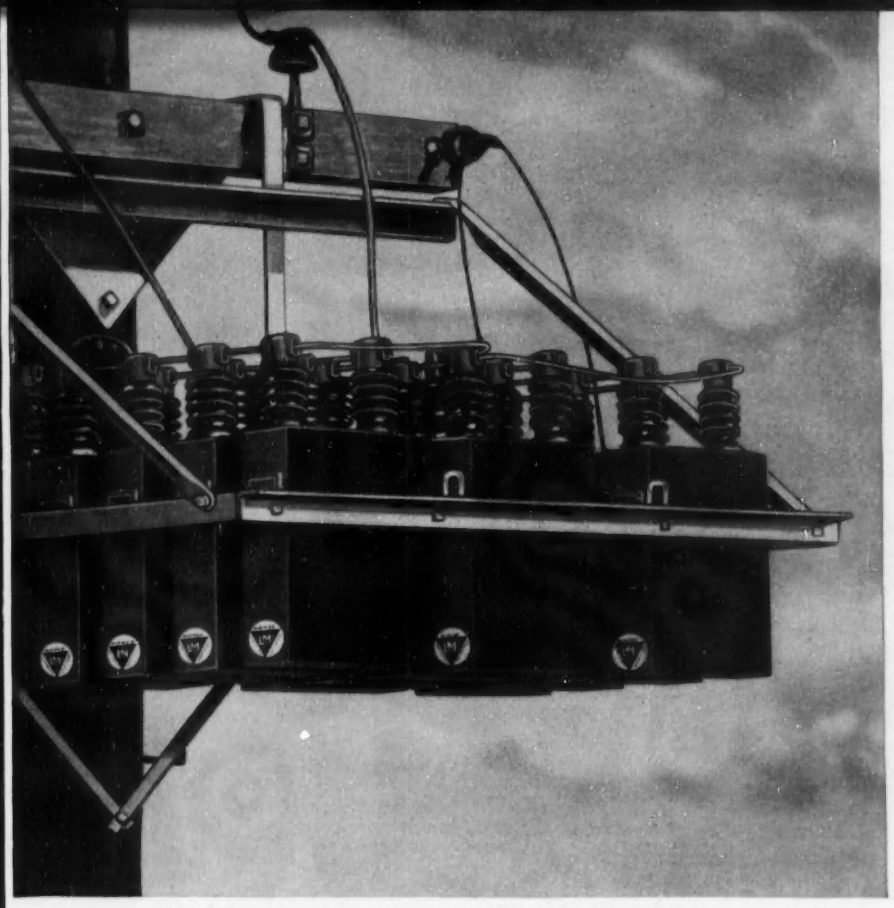
CHEVROLET

ADVANCE-DESIGN TRUCKS

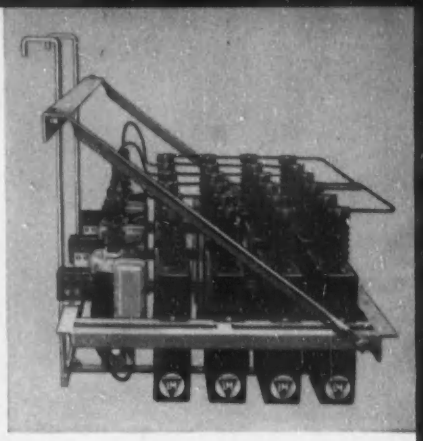
CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

THREE GREAT ENGINES—The new "Jobmaster 261" engine* for extra heavy hauling. The "Thriftmaster 235" or "Loadmaster 235" for light-, medium- and heavy-duty hauling. **NEW TRUCK HYDRA-MATIC TRANSMISSION***—offered on ½-, ¾- and 1-ton models. Heavy-Duty **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **DIAPHRAGM SPRING CLUTCH**—improved-action engagement. **HYPOID REAR AXLE**—for longer life on all models. **TORQUE-ACTION BRAKES**—on all wheels on light- and medium-duty models. **TWIN-ACTION REAR WHEEL BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—greater holding ability on heavy-duty models. **NEW RIDE CONTROL SEAT***—eliminates backrubbing. **NEW, LARGER UNIT-DESIGNED PICKUP AND PLATFORM STAKE BODIES**—give increased load space. **COMFORTMASTER CAB**—offers greater comfort, convenience and safety. **PANORAMIC WINDSHIELD**—for increased driver vision. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—easier, safer handling. **ADVANCE-DESIGN STYLING**—rugged, handsome appearance. *Optional at extra cost. Ride Control Seat is available on all cab models, "Jobmaster 261" engine on 2-ton models, truck Hydra-Matic transmission on ½-, ¾- and 1-ton models.

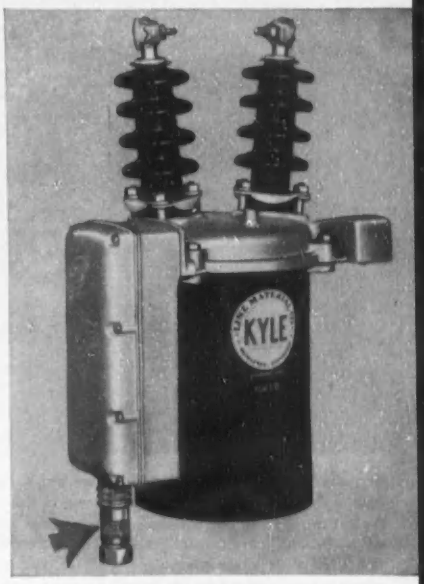
MORE CHEVROLET TRUCKS IN USE THAN ANY OTHER MAKE!



A 300 kvar switched capacitor rack installation. Wiring is completely neoprene-jacketed and bird-proof. Racks are available with or without the three L-M Kyle Type NR Oil Switches.



Stress on the pole is no problem—less than one transformer and one secondary drop. Capacitors are mounted vertically—which provides compactness and longer capacitor life.



L-M Kyle Type NR Oil Switch. Only low-cost switch with 200 ampere thermal rating and full 150 ampere nominal capacitive rating at 15 kv. Weatherproof plug-in connection at the base of each oil switch control housing. This makes it easy to connect or disconnect the switch without disturbing any of the wiring. Only one easy-to-reach connection on each switch.

You Save 3 Ways With ELEMEX CAPACITORS

by **DANIEL J. J. PIRHOFER,** Sales Application Engineer, Capacitor Division, Line Material Company

Since utility systems install power factor correction equipment for its economic benefits, you might as well make the saving involved as great as possible. L-M's ELEMEX Capacitors offer 3 special savings:

1 You save on installation costs with completely assembled and factory-wired racks.

2 You save on over-all life cost because quality design and rigid quality control result in capacitors with an exceptional service record. Failure rate is less than one-half the national average.

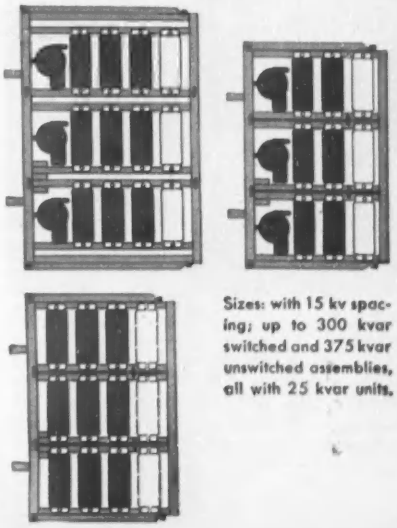
3 You save on automatic switching with L-M's simple, rugged, economical Voltage Control.

Racks and their features are illustrated above. The exclusive process that gives ELEMEX Capacitors such long life is shown on the next two pages. On the fourth page is the L-M Voltage Control. May we give you details? Ask the L-M Field Engineer for a copy of Bulletin PC-1—and, if you like, a copy of "ABC's of Capacitors." Or, write me at Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

148-1

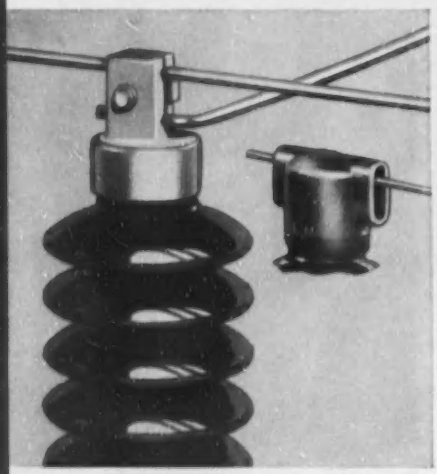
LINE MATERIAL

LM Elemex Capacitors

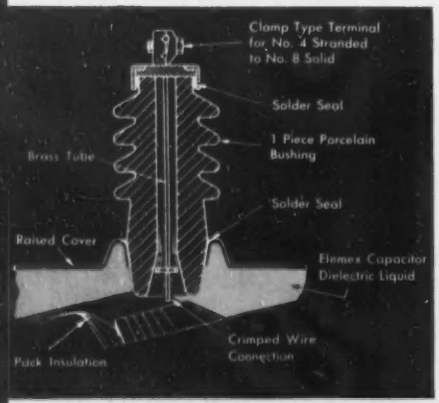


Sizes: with 15 kv spacing; up to 300 kvar switched and 375 kvar unswitched assemblies, all with 25 kvar units.

Every single pack is individually tested—with an over-voltage test that instantly reveals any actual and potential defects. Both faulty and marginal packs are rejected.



Exclusive "Paragroove" clamp-type terminal saves time and labor. Wire isn't threaded through a slot—it's just dropped in and clamped. Torque is vertical, not horizontal. Therefore in tightening you don't twist the bushing or stress the solder seal unduly. It's rugged; we've never had one break. No loose parts. Low resistance, less heating. Neoprene insulating caps also available.



Solder-sealed bushings are one-piece wet-process porcelain, with two metallized bands over the glaze. Bushings are hermetically sealed to drawn raised bosses in the cover that, shed water like a duck. Strong? It takes over 3000 pounds to force an L-M bushing out of the cover. And they're 100% pressure-tested—every single one!

Packs are wound by automatic machines in spotless, dust-free, air-conditioned rooms. Once the machine is set, it automatically winds the proper footage of paper and foil and locates the position for the electrodes. Thus, uniformity is assured. Paper is the highest-grade dielectric tissue, of 8/10ths density, which adds greatly to the very low failure rate of ELEMEX Capacitors.

L-M's Exclusive Process

The exceptionally long life of ELEMEX Capacitors is proved in the laboratory with accelerated life tests, and in the field under actual service conditions. In the accelerated life tests, ELEMEX Capacitors last twice as long as other capacitors. This is true—but why it is true is because of a number of things.

The fact that we use 8/10ths density paper is *important*. This density seems to yield better to impregnation, without being too porous, and gives a lower paper power factor. This results in better performance.

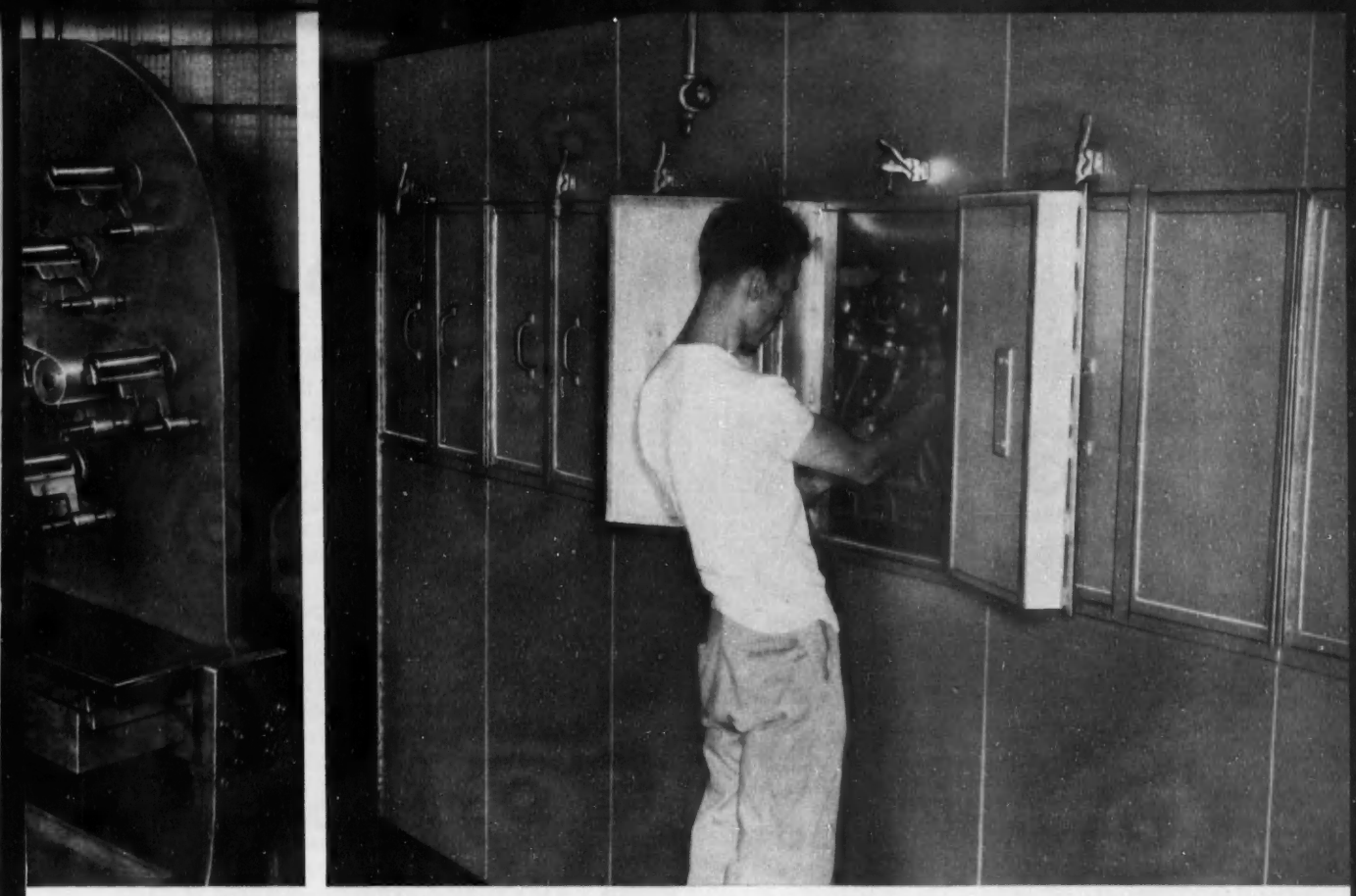
Another point is L-M's exclusive process of continuous, *individual* drying and impregnation. This is done with a very large-capacity high vacuum pump by means of individual capacitor connections, in an unsealed oven. Each unit is tested *during* the process.

Individual evacuation and testing assure that each capacitor becomes bone-dry, and that ELEMEX liquid slowly permeates every fibre of the paper. Even the bushings are completely filled with ELEMEX liquid, giving them exceptionally good electrical qualities.

The arc-welded tanks are designed to give the tank sides flexibility to allow for expansion and contraction of the ELEMEX liquid with changes in temperature. Tanks are sandblasted and then given three coats of baked enamel finish. The first coat is a red chromate primer, and the second and third coats are a melamine-modified alkyd resin enamel. This finish has been extensively tested under various weathering conditions. Severe atmospheric exposures such as coastal salt spray and sulphurous industrial conditions, and various laboratory tests, have proved the durability of the L-M finish as compared to other types of finishes.

ELEMEX Capacitors are outstanding in their performance and long life. L-M Field Engineers will be glad to supply additional data, details, and literature. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

"ELEMEX" is a Line Material trademark.



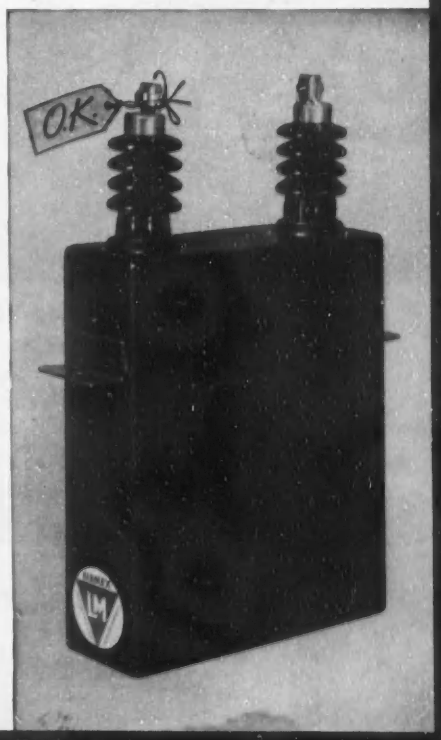
ELEMEX Capacitors are individually dried and impregnated in unsealed ovens like this. L-M evacuates only the *inside* of the capacitors, not the space around them. Air at controlled temperatures is circulated around the entire capacitor to maintain proper internal temperatures, giving better drying and complete impregnation. Also, the heat cures the paper, lowering its power factor and providing a low power factor in the completed unit. Each unit gets individual tests of power factor and capacitance *during* evacuation. These tests assure proper timing of each step in the process.

Reduces Capacitor Replacement

Tanks are sandblasted. Then they get a coat of red chromate primer, and *two additional* coats of melamine-modified alkyd resin enamel. Each coat is cured by baking.

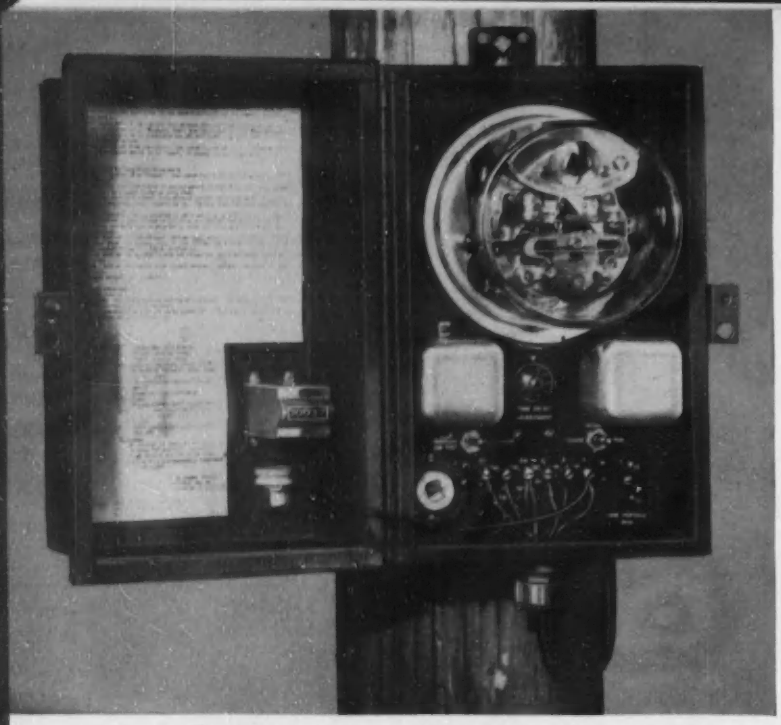
The completed capacitor. Its test record tag, which has followed it throughout the process, is filed. Stainless steel tank flanges carry the nameplate identification. All ELEMEX Capacitors have the same width and thickness. Hanger flanges are placed to provide uniform terminal elevation above the hanger in each voltage class. This makes it easy to change from 15 to 25 kvar, if desired.

148-2



LINE MATERIAL

Elemex Capacitors



L-M's Voltage Control. Nominal line adjustment, 110 to 130 volts. Band width adjustment, 12 volts maximum. Time delay, instantaneous to 4½ minutes with synchronous motor drive. Toggle switches permit automatic, test or manual operation. Weatherproof steel cabinet with 1-inch threaded pipe fitting and two multiple knockouts.

Low-Cost Voltage Control for Capacitors

L-M's Voltage Control is a rugged, dependable device that makes automatic capacitor switching economical.

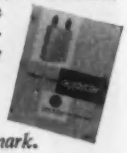
The L-M Type CCV Voltage Control provides a simple, economical method for switching capacitors. It was designed to eliminate some of the difficulties inherent in balanced-beam solenoid types of controls.

Its low cost makes it possible to take greater advantage of the benefits that switched capacitors can provide. While the unit is designed to operate with L-M's Kyle Type NR Oil Switch (incorporated in L-M's pre-assembled capacitor racks) the CCV may also be adapted for use with other motor-driven or solenoid-operated equipment such as circuit breakers.

Heart of the control is a modified watt-hour meter which has been made volt-sensitive. This unit provides easy adjustment, permanent bandwidth settings, convenient size, simple installation, and low cost. The device provides approximately 3/16-inch contact travel per volt (120 volt base), assuring extremely sensitive operation. The voltmeter is temperature-compensated from minus 30 to plus 140 degrees F. Line voltage can be determined without the use of portable instruments. Once band width and midpoint settings are established, they remain fixed.

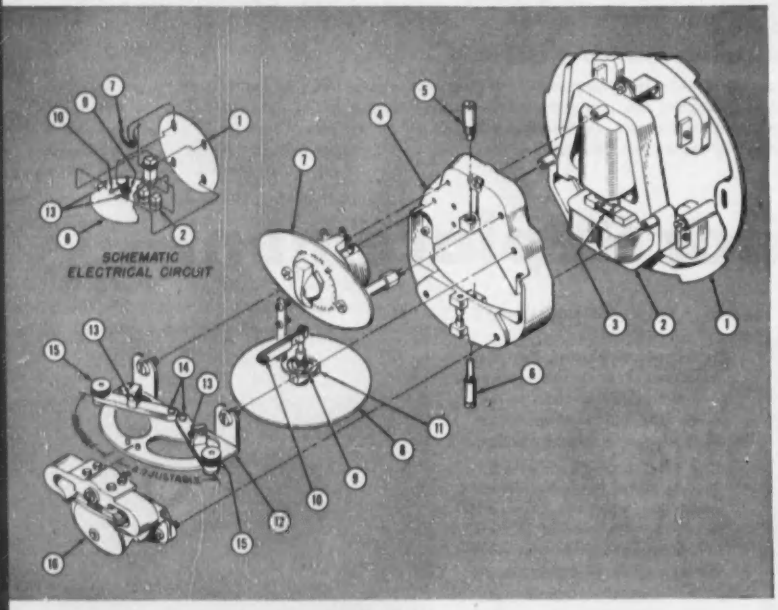
Let Us Send You Details

Ask the L-M Field Engineer for copy of Bulletin PC-1, which includes detailed description of construction and operation features; or write Line Material Co., Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



"ELEMEX" is a Line Material trademark.

148-3

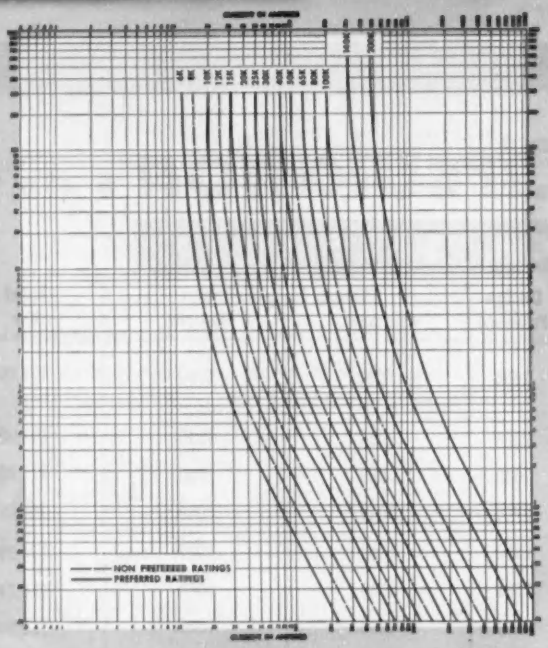


Contact-Making Voltmeter Components

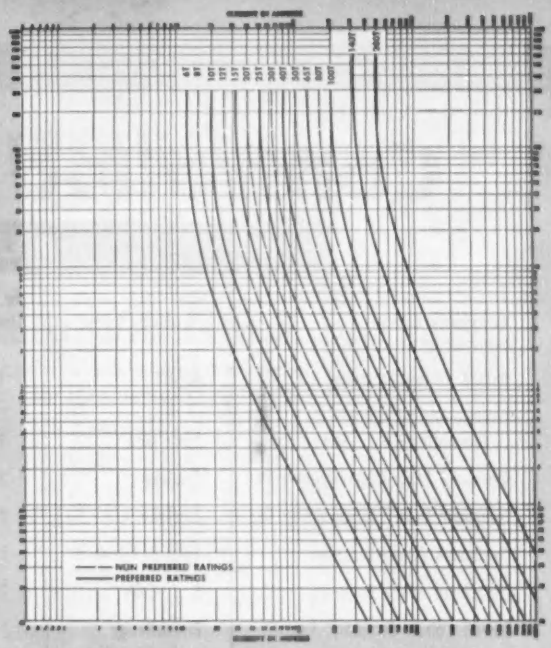
1. Base Plate
2. Core and Coil Assembly
3. Temperature-Compensating Magnetic Shunt
4. Frame Casting
5. Upper Bearing
6. Lower Bearing
7. Nominal Voltage Adjustment Rheostat
8. Induction Disc Assembly
9. Current-Carrying Spiral Spring
10. Moving Contacts
11. Static Counterbalance
12. Stationary Contact Plate Assembly
13. Stationary Contact
14. Bakelite Arms
15. Knurled Clamping Nut
16. Damping Magnet Assembly

LINE MATERIAL

Elemex Capacitors



"K" (fast) Links—minimum melting curves. Speed ratios vary from 6 to 8.1.



"T" (slow) Links—minimum melting curves. Speed ratios vary from 10 to 13.

Large size copies of these curves available from L-M on request

L-M Makes Available Complete Line Of New EEI-NEMA–Standard Fuse Links

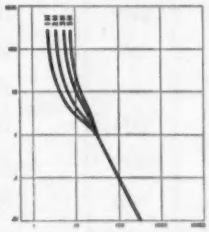
By R. D. Cleaves
Manager
Protective and Switching
Equipment Sales
Line Material Company

A joint project between users, represented by EEI, and manufacturers, represented by NEMA, has recently resulted in the establishment of definite time-current characteristics for fuse links. These have now been adopted as standard by the industry, in sizes covering all major operating requirements.

As a major fuse link manufacturer, Line Material Company has now made available a complete line of links meeting the new standards. L-M's new EEI-NEMA Fuse Links offer you these benefits:

1. **Industry-standard mechanical and electrical interchangeability, with assurance of uniform degrees of coordination between adjacent link sizes.**
2. **Two speeds—"K", fast, and "T", slow —with time-current characteristics to meet all major operating requirements.**
3. **Better coordination with reclosers covering a wider range of fault currents.**
4. **Simplified purchasing, stocking, and application.**
5. **Positive performance, precise electrical characteristics, and guaranteed quality.**

New L-M High Surge Links for sizes below 6 amperes



L-M High Surge Links —minimum melting curves

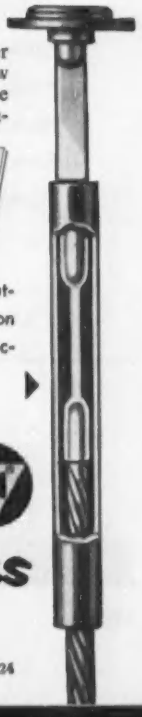
Today transformers are frequently worked up to their maximum thermal capacity. In protecting from overload, the protecting fuse link should remove the transformer from service whenever this capacity is exceeded. But it is important that the fuse link does not blow from surges and momentary overloads, causing needless outages and service trips.

Links large enough to stand these surges will not give adequate overload protection. Therefore L-M has provided a line of High Surge Links in 1, 2, 3, and 5 ampere sizes, which will stand the momentary inrush currents, and yet provide adequate protection.

These links have characteristics similar to 1, 2, 3, and 5 ampere N-rated links on the low current end, and 10 ampere N links on the high current end. These L-M High Surge Links allow good coordination with either the 10-"K" or 8-"T" EEI-NEMA links; and they supplement the EEI-NEMA-standard line.

Get Full Information

Ask the L-M Field Engineer for details and copy of new Bulletin FC5A. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



Rating clearly marked on button. One-piece forged button and shank. Horn fibre protective tube. Die-cast tin fusible section.

LINE MATERIAL

fuse cutouts and fuse links

It's Time to Roll Up Your Sleeve—Give Blood Now

Controlled Circulation . . .

PURCHASERS

Company Name	Station Name	No. of Units	Design Pressure	Steam Temperature Primary	Steam Temperature Reheat	Total Kw
Boston Edison Company	Mystic	1	2150	1000	1000	125,000
Chicago District Electric Generating Corp., The	State Line	1	2300	1050	1050	191,000
Cleveland Electric Illuminating Co.	Eastlake	3	2030	1050	1000	375,000
Cleveland Electric Illuminating Co.	Eastlake	1	2750	1050	1050	208,000
Consumers Power Company	John C. Weadock	1	2300	1050	1000	135,000
Consumers Power Company	B. C. Cobb	1	2300	1050	1000	156,250
Detroit Edison Company, The	River Rouge	1	2300	1050	1000	260,000
Duke Power Company	Riverbend	2	2030	1000	1000	270,000
Duke Power Company	Dan River	1	2030	1000	1000	135,000
Duke Power Company	Buck	2	2030	1000	1000	270,000
Illinois Power Company	Vermilion	1	1650	1005	1005	75,000
Illinois Power Company	Vermilion	1	1850	1000	1000	100,000
Pennsylvania Electric Company	Seward	1	2500	1055	1005	125,000
Philadelphia Electric Company	Cromby	1	2075	1000	1000	200,000
Potomac Electric Power Co.	Potomac River	2	2075	1050	1000	200,000
Public Service Elec. & Gas Co.	Kearny	2	2650	1100	1050	290,000
Southern California Edison Co.	Etiwanda	2	2100	1000	1000	250,000
Tennessee Valley Authority	Kingston	5	2060	1053	1053	1,000,000
Tennessee Valley Authority	John Sevier	3	2060	1053	1053	600,000
Tennessee Valley Authority	Gallatin	2	2275	1053	1053	500,000
Virginia Electric & Power Co.	Possum Point	1	1670	1000	1000	100,000
Virginia Electric & Power Co.	Portsmouth	2	1670	1000	1000	200,000
Virginia Electric & Power Co.	Chesterfield	1	1670	1000	1000	100,000
Wisconsin Electric Power Co.	Oak Creek	1	1775	1000	1000	120,000
Wisconsin Electric Power Co.	Oak Creek	1	2025	1000	1000	120,000
Wisconsin Electric Power Co.	Oak Creek	1	2250	1000	1000	120,000

SUMMARY

Number of Units – 41
Total Capacity – KW – 6,207,250
Number of Units in Service – 11
Total Capacity of Units in Service – KW – 1,380,000

• • • • 1950 — 1953

PROVEN ADVANTAGES

GENERAL

1. Positive circulation before applying heat.
2. Controlled circulation in exact proportion to calculated heat distribution.
3. Steadier water level on quick load swings.
4. Faster response to load demands.
5. More time to act in event of tube failure due to small tubes and low discharge rate from rupture.
6. No loss of turbine capacity if tube ruptures until load reduction can be planned.
7. Quick access to furnace due to rapid cooling, and short outages for maintenance.
8. No hideout of solids in boiler water.

GREATER DESIGN FLEXIBILITY

1. Tube circuits may be of unequal length or unequal heat absorption.
2. Water-cooled spacers and supports may be used in place of special alloy castings for superheater, reheater, and economizer. These are tied into the circulating system and are always cooled effectively.

OPERATING ECONOMY

1. Lower weight of pressure parts and water saves fuel on start ups.
2. Shorter start-up, cooling off and outage time means more operating time.

MAINTENANCE

1. Small diameter, thin wall tubes are less expensive to repair.
2. Quicker start-up, shutdown and cool-off periods save much time.

FURNACE-WALL SURFACE

1. Use of small diameter tubes:
   (a) Permits use of thin wall tubes.
   (b) Reduces weight of tubes by half.
   (c) Produces high velocity in tubes.
   (d) Results in low hot face temperature of tubes.
   (e) Assures lower thermal stress and reduced total stress in tubes.
   (f) Higher factor of safety.
2. High permissible heat absorption rate.
3. Minimum of time and expense for maintenance when necessary.
4. All welded construction.
   (a) Elimination of rolled joints.
   (b) Elimination of handholes and gaskets.

STRUCTURAL

1. Small diameter, thin wall furnace tubes result in:
   (a) Lower water weight in operation.
   (b) Lower weight of structural supports.
   (c) Lower load on foundations.

BOILER DRUM

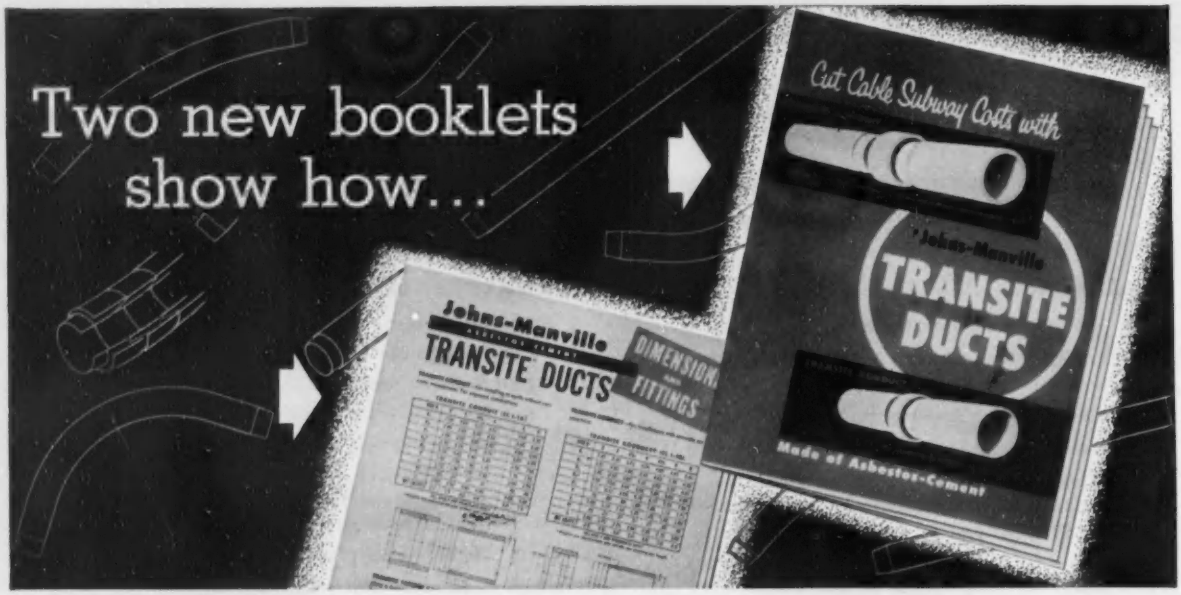
1. Lower circulating rates result in:
   (a) Half the amount water to separate from steam.
   (b) Fewer steam-separator units.
   (c) Smaller diameter, thinner wall drum.
   (d) Larger access space for given diameter.

B-718

COMBUSTION ENGINEERING, INC.

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

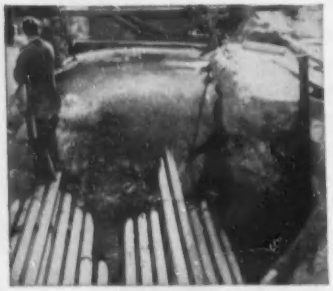
BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE



Transite® Ducts cut cable subway costs—

give greater cable protection

Transite Conduit is the thicker walled duct which is used for exposed work or is laid directly in earth without a concrete encasement. Saves time, labor and materials on the job



Transite Korduct® is the thinner walled duct for installation in concrete. Inasmuch as it is used principally for hi-voltage lines, its high thermal conductivity reduces operating losses

• Johns-Manville presents these brochures as a service to public utilities, design engineers, and all other users and planners of cable subway systems. "*Transite Ducts*" shows how improved cable subway protection, installation, maintenance and operational savings may be achieved. "*Transite Ducts, Dimensions and Fittings*" give the necessary dimensional data on all ducts and fittings.

Transite Ducts offer improved cable subway protection. Made of asbestos and cement, Transite cannot burn, smoke, fume or generate explosive gases. Transite confines arc damage and protects adjacent cables against heat and flame. Transite resists corrosive action of soils; is unaffected by electrolysis.

Installation savings result because Transite is strong, light in weight, easy to handle. It comes in long, 10-foot sections, thus, fewer joints are required. Its permanently smooth bore prevents injury to cable either from natural movement or when pulling cable through. Maintenance savings result from the permanent nature of the asbestos cement composition of Transite. It is as durable as stone.

Moreover, operational savings result because cables run cooler due to the high thermal conductivity of Transite Ducts. This also results in prolonged cable insulation life.

For complete details on how Transite Ducts can cut cable subway costs for your system, send for copies of "Transite Ducts," EL-29A and "Dimensions and Fittings," EL-45A. Write to Johns-Manville, Box 60, New York 16, New York. In Canada, 199 Bay Street, Toronto 1, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

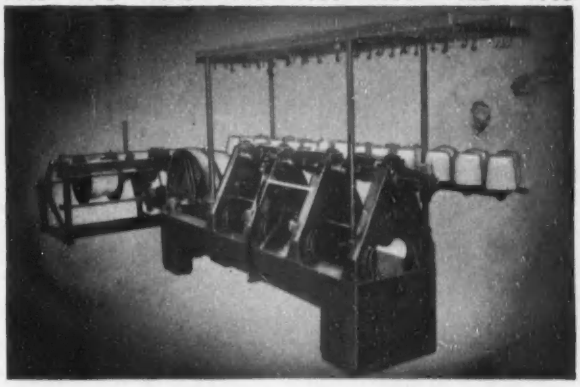
TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

More and more, leading wire manufacturers the world over are proving the advantages of the *Fidelity Sinfra Knitter.**

With each new installation the *Sinfra* establishes —time after time—its ability to cover wire faster and more economically than any other method.

Today, the list of *Sinfra* users includes the world's foremost manufacturers of Wire and Cable.

Why not prove for yourself the outstanding advantages of this amazing machine? Write today for Catalog W-1 or visit the new show rooms at our plant.



*Approved by Underwriters' Laboratories, Inc., American Standards Association, Association of American Railroads, Canadian Standards Association, and Federal Specification J-C-145.

Designers and Builders of Intricate, Automatic Precision Machines

SINCE 1911

FIDELITY MACHINE COMPANY, INC.

3908-18 FRANKFORD AVENUE, PHILADELPHIA 24, PA.

Export Dept.:
25 Beaver Street, New York 4, N. Y.

Canadian Representative:
The Larson Co., Toronto, Ontario, Canada.

The Trucks That Start Where Others Stop!

RESERVE CAPACITY in NEW FWD

with MATH • MATIC

IMPROVED ALL-STEEL SAFETY CAB—Live rubber shock absorbers and improved twin-pivot support dampen off-the-highway jolts; adjusting comfort seat is a full 70" wide; suspended, cab-mounted foot pedals assure leverage regardless of driver height, eliminate floor openings. Picture window visibility; armored fuel tank outside cab.

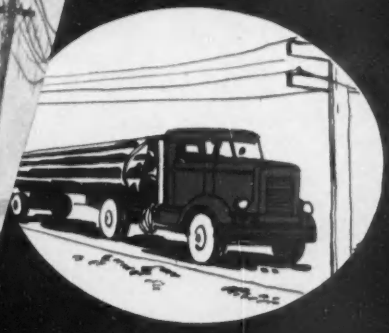
You'll restore power faster when you dispatch men and materials to the trouble spots in new **FWD FOURMASTERS** with exclusive Math-Matic Design. This great engineering advancement *puts the power where there's work to be done* by properly proportioning torque to weight. With more and more off-the-highway locations and relocations in the picture, you *need* units that *don't* need roads.

Up to 82% greater tractive ability*—30 to 37% longer tire life*—same fuel consumption as rear-wheel drive trucks*—safest by far to operate under any on or off-the-highway conditions*... these are dollar and sense reasons why utility officials everywhere are turning to new **FWD FOURMASTERS** with Math-Matic Design. **THE FOUR WHEEL DRIVE AUTO CO., CLINTONVILLE, WIS.** *Canadian Factory*, **KITCHENER, ONT.**

FOURMASTERS

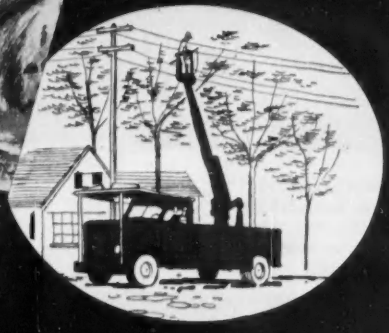
DESIGN

In emergencies you *can't* baby men or equipment—but utility officials find that FWD FOURMASTERS make the *best* of bad situations, get the job done *fast* and *efficiently*.



Less time on the *road* means *more* time on the *job*—and lower operating costs. Drivers find FOURMASTERS more comfortable, safer to drive than other trucks under any road condition.

Off-the-highway locations are murder for most trucks, but a cinch for FWD FOURMASTERS with *correctly proportioned power on all* wheels. Fleet managers acclaim FOURMASTERS' easy maintenance and longer life.



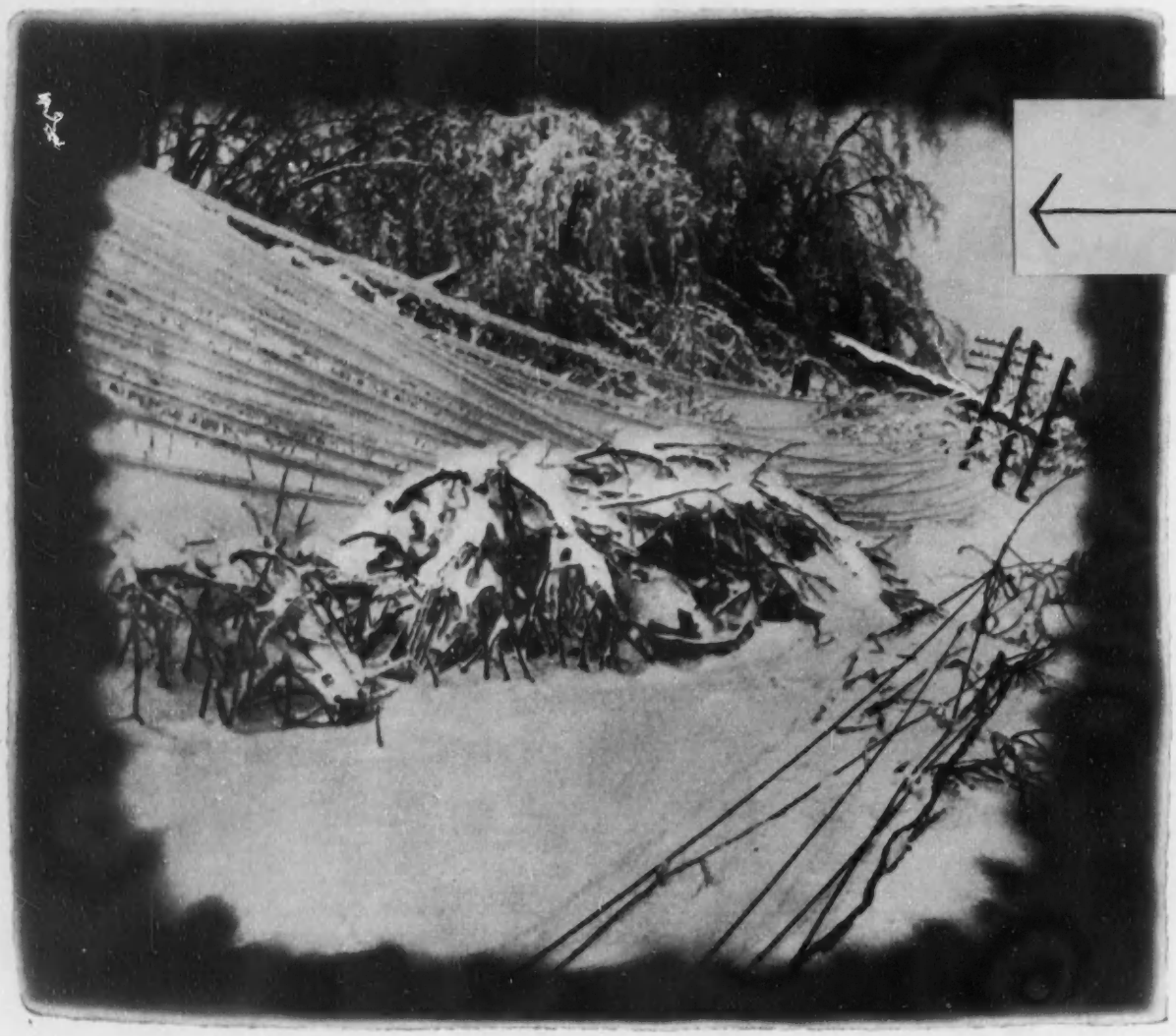
There's a FOURMASTER for every utility maintenance and construction job, with the exact type of body and equipment you need—over eighty combinations—and the "single responsibility" crew foremen like.

FWD

AMERICA'S FOREMOST HEAVY-DUTY TRUCK

MATH-O-MATIC DESIGN

*TRUCK RESEARCH PROJECT CONCLUSIONS. . . . *For unvarnished facts on truck performance, read the results of 7 years' intensive research conducted by the University of Wisconsin's College of Engineering. Your free copy of "The Truck That Went to College" is awaiting your request.*



(ABOVE) **Rome Pre-Assembled Self-Supporting Aerial Cable For Primaries**—Supplied in various designs incorporating RoZone insulation, shielding where needed (generally over 5 KV) and outer protecting coverings of RoPrene (Neoprene) or corrosion-resistant metallic tape in accordance with IPCEA standards.

(LEFT) **Rome Triplex Self-Supporting Secondary or Service Drop Cable**—RoPrene (Neoprene) or RoLene (polyethylene) insulated copper or aluminum power conductors spiraled around a suitable neutral messenger of copper, copperweld, aluminum or ACSR.

Guard against this nightmare

Wind and ice loading are kept at a minimum by Rome self-supporting cables. They reduce crossarms and permit shorter poles.

Fewer accessories, reduced cable cost and cleaner, neater installations result from using Rome Triplex service drop cable.

Poles top-heavy with crossarms and wires. A vicious ice storm. Heavy winds. Broken poles and wires. It is the nightmare of power outage and costly replacements.

You can minimize this expense and customer dissatisfaction by standardizing on Rome self-supporting cables.

Manufactured to your specification, with either copper or aluminum conductors, Rome self-supporting cables utilize the time-proven construction of insulated power conductors spiralled around, or bound to a neutral or supporting messenger. These cables are mechanically predesigned, with a large factor of safety, to anticipate ice and wind loading.

Low installation and maintenance costs

You will realize substantial savings with Rome self-supporting cables, both in installation and maintenance. Crossarms can be eliminated, less hardware is required and, often, fewer poles because of longer spans. Maintenance costs are lower, too. Requiring no common covering, conductors are readily accessible for easy taps. Tree trimming is minimized through excellent resistance to abrasion.

Longer service life in all weather

Insulated or sheathed with RoLene (polyethylene) or RoPrene (Neoprene), Rome self-supporting cables are unaffected by sunlight, moisture and corrosive atmospheres. There are no fibrous braids to rot and festoon. Replacement is kept to a minimum. Better voltage regulation is, also, a factor because of lower reactance due to the close spacing of insulated conductors in long or heavily loaded circuits.

Whether for 600 volts or 15,000 volts, if it is going overhead, it will pay to do as so many others are doing... check the advantages and economies of Rome self-supporting cables. They are cables engineered to the service involved. The coupon below will bring you information on their properties and characteristics.

You'll find a wealth of helpful information on physical and electrical characteristics, specifications, dimensions and installation data on these and other Rome wires and cables in Bulletin RS-5, and the Power and Control Cable Catalog. Send for them today. Mail the coupon.

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

ROME CABLE CORPORATION, Dept. EW-1, Rome, N. Y.
Please send copy of .... Bulletin RS-5, ... Rome Power and Control Cable Catalog.

Name.....

Company.....

Address.....

City..... Zone..... State.....

FROM 1 HP. UP...

Elliott covers the

Looking for integral horsepower motors?

You will find the motor you need in the extensive Elliott Crocker-Wheeler line. Elliott motors combine the substantial quality of famous name reputation with the equally valuable factor of Elliott progressive engineering development. A typical group of these motors is illustrated here, including the widely used Elliott C-W totally-enclosed fan-cooled motor, available in both standard and explosion-proof enclosures; the new Elliott C-W gearmotor, and the dependable, compact Elliott C-W brake, available with any Elliott C-W motor.

Get complete technical data on these or other motors in this line by contacting your local Elliott representative or writing Elliott Company, Crocker-Wheeler Division, Ampere, New Jersey.

ELLIOTT

CROCKER-WHEELER DIVISION

Checking on big motors?

Look over the Elliott achievements of recent years in big motors — the soundly established advantages of Elliott Fabri-Steel construction — strong, rigid and above all, adaptable... the facility with which a standard motor can without change in electrical design be provided with any type of enclosure, including the now famous Elliott Outdoor Splashproof (weather-protected) motor... the excellent workmanship including long-life mica-wrapped coils, with insulation engineered to the need, and careful end-turn lashing and bracing. Your local Elliott engineer will give you details on these motors, or write Elliott Company, Ridgway Division, Ridgway, Pa.

Company

RIDGWAY DIVISION

Elliott FABRI-STEEL

Q3-2

AIR CONDITIONED!

it's cool inside

GUTH

PEERLITE

Trademark

Permits flexible pattern planning. You can form any design you wish. For 2, 3, or 4 lamps — 4' or 8' long.

more cooling less cleaning

Wide open on top and bottom for brisk air-circulation

Cool lamps last longer.
Clean lamps stay brighter.
Clean fixtures give more light!

RESULT: greater efficiency
less maintenance
long-lasting beauty

*U. S. & Can. Pats. Pend.
Trademark registered

Write on your letterhead today for Catalog 911-H.

THE EDWIN F. GUTH COMPANY ST. LOUIS 3, MO.

Leaders in Lighting since 1902

35 KV

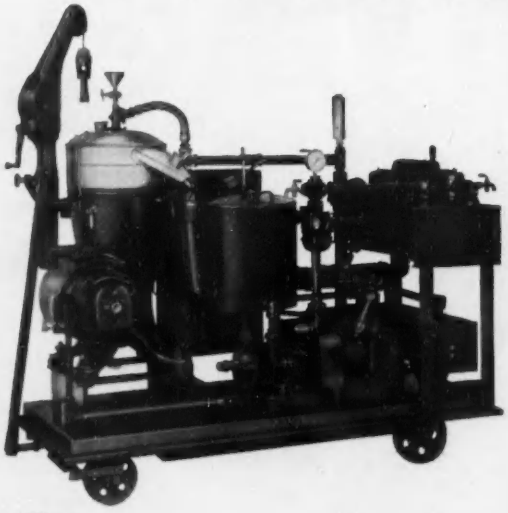
or even better!

So efficient is the De Laval method of purifying insulating oil that it is possible to guarantee that when operated at its rated capacity, each De Laval Insulating Oil Purifier will reduce the water content of new transformer oil at a temperature of 90° F from an initial 1/10 of 1% to 1/1,000 of 1% (one part of water in 100,000 parts of oil)—at 35 kv dielectric strength.

As a matter of fact, the 35 kv figure is often exceeded in actual practice.

De Laval accomplishes its purification in a single pass through the centrifuge. The dehydration is accomplished without the aid of a filter press, although one is usually furnished for the removal of colloidal carbon from circuit breaker oil.

• *Write for details*

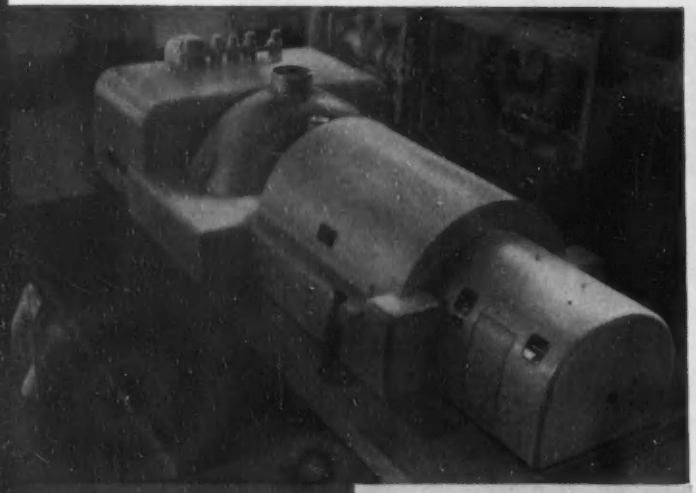


THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

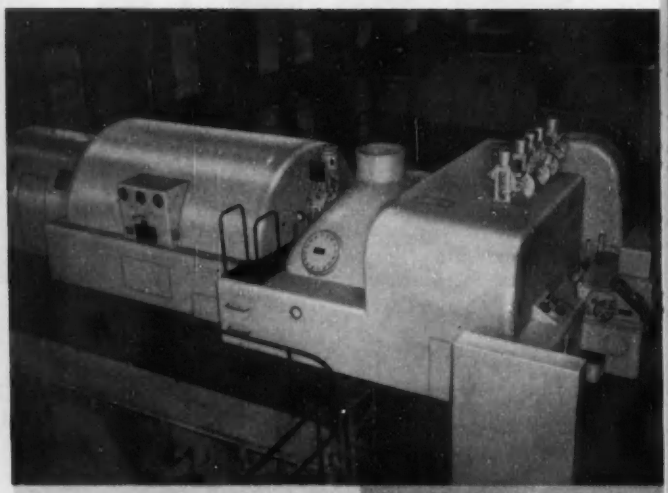
DE LAVAL

INSULATING OIL PURIFIERS

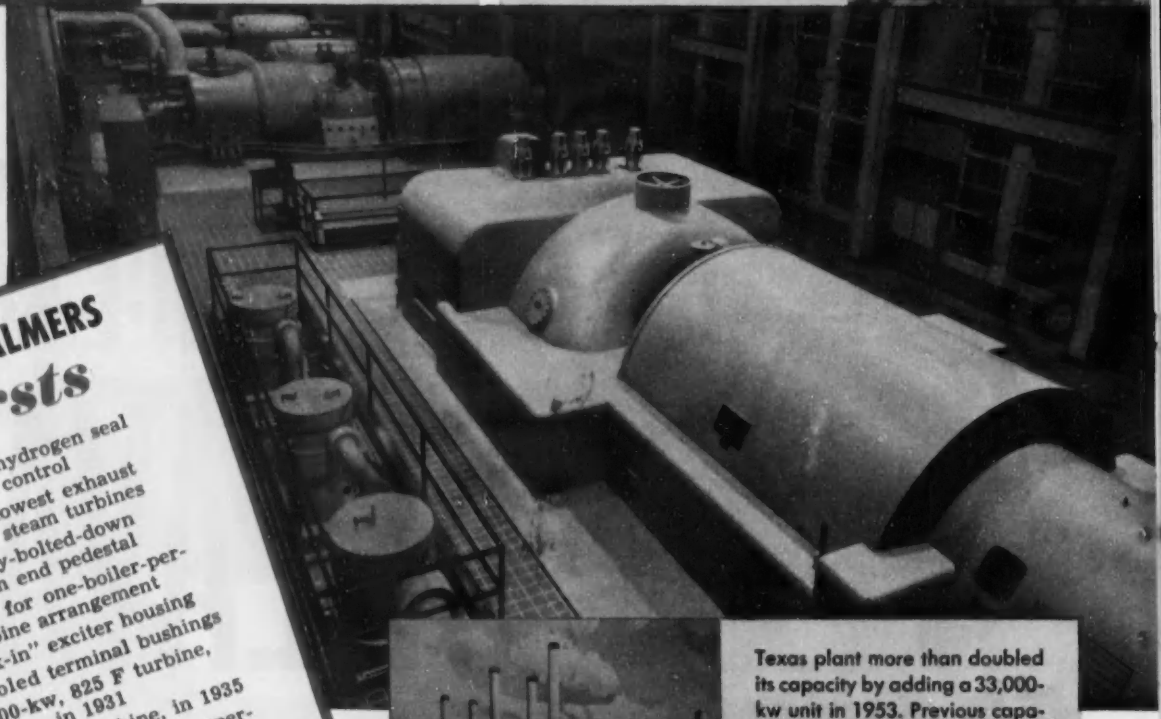
Expanding



California's Imperial Valley is the setting for this 33,000-kw turbine-generator installation. Allis-Chalmers also supplied the condenser shown in this semi-outdoor power plant.



Upper Midwest area is represented by 22,000-kw turbine-generator unit placed in operation in 1952. Two 10,000-kw units in background were also supplied by A-C.



ALLIS-CHALMERS ★ Firsts

Simplified hydrogen seal and control

World's lowest exhaust pressure steam turbines

Solidly-bolted-down steam end pedestal

Turbine for one-boiler-per-turbine arrangement

"Walk-in" exciter housing

Jet-cooled terminal bushings

30,000-kw, 825 F turbine, in 1931

825 F reheat turbine, in 1935

And NOW ... First with super-charged hydrogen cooling

Texas plant more than doubled its capacity by adding a 33,000-kw unit in 1953. Previous capacity consisted of one 15,000-kw and two 5000-kw units — all supplied by Allis-Chalmers.

POWER
...Coast to Coast!

Dependable Allis-Chalmers Turbine-Generator Units Keep Pace with Growing Nation-Wide Power Demand

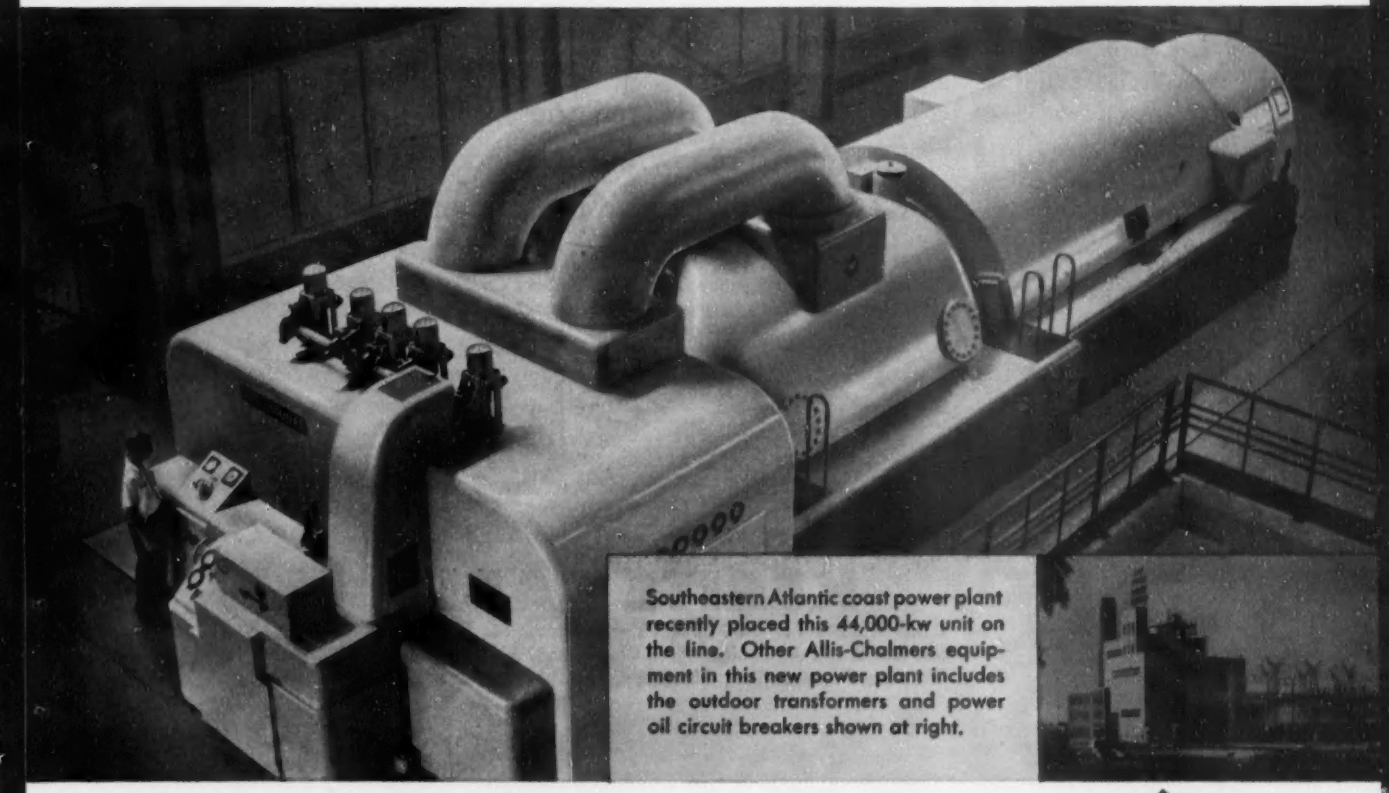
FROM coast to coast and border to border, the nation's demand for power continues to soar. Pictured here are a few of the newly installed Allis-Chalmers steam turbine-generator units now helping to satisfy that country-wide mounting demand for electric power.

Each of these modern 3600-rpm units conforms to AIEE-ASME preferred standards, and all of them include important A-C design features.

The generators offer simplified hydrogen seals and control, spiral stator ventilation, flexible core mounting, and "walk-in" exciter housings.

Outstanding turbine features include accessible placement of hydraulically operated stop valve, centralized grouping of operating controls, conveniently located cam-operated inlet valves, and an effective method of compensation for horizontal and vertical thermal movement. Above-the-floor oil piping simplifies foundation and installation. The steam-sealed gland system, feeding labyrinth-type glands, is self-contained and automatic, for dependability with minimum attention.

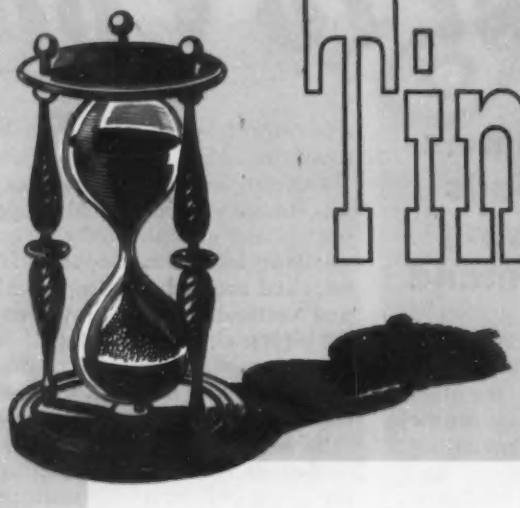
These and other advanced turbine and generator design features are also incorporated in 60,000-kw to 150,000-kw reheat units now in operation or nearing completion. For more information, contact your A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-4187



Southeastern Atlantic coast power plant recently placed this 44,000-kw unit on the line. Other Allis-Chalmers equipment in this new power plant includes the outdoor transformers and power oil circuit breakers shown at right.

ALLIS-CHALMERS

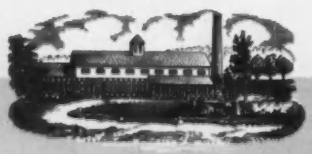
A-C ALLIS-CHALMERS



Time

Time is the measure of all things. Few of man's inventions can stand its merciless judgment. Yet Kerite for 100 years has thrived and spread and gained renown. Time, indeed, gives Kerite its unqualified recommendation.

The Value And Service Life Of A Product Can Be No Greater Than The Integrity And Craftsmanship Of Its Maker.



KERITE CABLE

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Golden Anniversary Report

This issue of Electrical World is our 50th Statistical Issue. Our golden anniversary could have come at no better time. For 1953 was indeed a "golden" year for the industry. It was a year of progress, of great accomplishments, and of unusual records. These statistics reflect and prove the great progress made in 1953:

Capacity was increased by 8.7 million kw.

Production increased 43 billion kwhr.

Large light and power sales increased 22 billion kwhr.

Residential use was boosted 181 kwhr per customer to 2,350 kwhr a year.

Capital expenditures totaled $4.1 billion.

Use of coal for steam generation was brought down to an average of 1.07 lb per kwhr.

In relation to the national economy the industry gained substantially in 1953. Although gross national product expanded 5% to $367 billion from the $348 billion of 1952, the electrical industry gained even more. For instance, electric utility revenues went up from 1.76% of the GNP to 1.85%. And retail value of appliance sales represented 2% of total business in 1953 as compared with only 1.7% in 1952.

In assembling industry data for this issue every care was taken to make this compilation of industry information the most complete and timely ever published. But completeness and timeliness in themselves were not enough to satisfy the editors. Additional effort was directed at making the information more understandable for the reader and in presenting it in such a way that he can from his own experience interpret the data for his own use.

Data are broken down by power supply agencies, areas, companies, and classes of service. Newly revised shipment indexes of electrical manufacturers have been included. Industrial power use and self generation for a number of years have been summarized. There is an extensive listing of power plants under construction or to be erected by 1956. And the power activities of Canada and the United States territories have been covered more extensively than in past years.

So with great pride we commend this issue to our readers for their information, use, and enjoyment. And to the industry we offer our congratulations for a golden year.

Home Service Values

How important is home service in the electric utility operations picture?

No more and no less important than the utility wants to make it. And those utilities that want to make it really important can realize profit not only from tangible results in residential load building but also in improvement of public and trade relations.

This conclusion is plain from a breakdown of the attendance at the 1953 home service conference of Georgia Power Co. This is an annual affair which has developed from a simple get-together of department personnel into an important convocation of electrical and educational interests of the whole state of Georgia. Of the 226 registrants, only 53 were members of the home service staff. Other company personnel numbered 59, including 25 vice presidents, division and district managers, and other executives. The fact that these 59 sat through two days of discourse and demonstration on home service activities indicates the value management puts on such activities.

But it was the attendance of 114 other than company people that is significant. To become better acquainted with and to get ideas from their power company sisters, home economists came from 11 electric membership cooperatives, all the co-ops that purchase electricity from Georgia Power. Educators in home economics and extension service workers numbered 19. Manufacturers and distributors had 48 representatives present. Other electric utilities sent 12 people, and the local gas company sent six. The remaining 18 included electrical contractors and dealers, reporters, trade magazine editors, and a number of others not identified by business connection.

This fact of more non-company than company people —114 as against 112—registered at the conference is strong indication that the home service activities of an electric utility have important and favorable effect in community and trade relations quite apart from load-building value. Georgia Power gets both from its home service department. Other power companies can do the same if they will. And they can expect to get the same excellent results.

Time to Restudy Transformers

Extensive study 20 years ago evolved the ratio of copper to coil losses and the voltage regulation characteristics of most distribution transformers in service today. Factored into the decision were the limitations of hand-stacked, silicon-steel cores. Reticence of manufacturers to encourage loading beyond nameplate and the low load factor of residential loads both lessened the penalties for copper loss and for voltage regulation.

Today's conditions are much different. Loading to the thermal limits has become the accepted practice. Residential load factor is up. And voltage regulation often impedes full use of thermal capabilities.

Today's transformers are much improved. The swing to oriented-steel cores has permitted smaller designs, reduced losses, and bettered voltage regulation. But emphasis has been upon using the new materials and methods to hold down transformer weight and cost.

Transformer cost is an important factor in overall distribution investment. But it is only one of many factors. Another is the primary conductors to supply the transformers and the secondary conductors to serve the customers. Distribution conductor capabilities today are usually established by voltage drop, not current alone. So a volt saved at the transformer may reduce the conductor investment.

Manufacturers report that it is possible with modern methods and materials to build distribution transformers with improved voltage regulation. One technique is interleaving coil sections to cut leakage reactance. "But," they ask, "would utilities accept the cost increase of such windings?"

At this time of looking ahead, we urge utilities to review their analyses of transformers—secondary economy. This is their opportunity to determine whether distribution for double the load ten years hence might be better and cheaper with different transformer characteristics.

The British Plan to Go Half Way

Development of nuclear energy in Great Britain has been in the hands of the Ministry of Supply. Now in a White Paper the government has announced its plans for transfering all atomic energy activities to an Atomic Energy Corporation. Here is the reason:

"As the industrial uses of atomic energy become relatively more prominent, the case for a form of control of the project which is more akin to the structure of a big industrial organization than to that of a government department becomes increasingly strong. It will, in the government's view, become stronger with the increase in the need for closer cooperation with industry and the widening application of atomic techniques."

Realization on the part of the British that to get anywhere in the atomic energy field they will have to divorce science from the government is commendable. Unfortunately, the British plan to go only half way. Their AEC will be a government-owned and controlled corporation. In both Britain and America now is the time to go all the way. The development of nuclear energy (certain military, thus secret, aspects excepted) should be turned over to private industry. And in both countries private industry should gladly assume the burden that it bore so successfully in the development of so many other scientific discoveries and inventions.

Sure! It Will Sell

Anyone who thinks people won't buy electric house heating because it costs more than coal, oil, or gas heating better take a look at the latest coffee maker to appear on the market. Its price is $50.

The maker of this automatic electric percolator would not offer it if he were not pretty sure it could be sold. He is not bothered by the fact that a coffee pot can be purchased in the dime store. No sir! His percolator, he says, will "extract the greatest amount of flavor-bearing, aromatic coffee oils from ground coffee beans." It has "magic vents" that let flavor-killing gases out before they can contaminate the brew. Not to speak of the 24-carat gold-plated base.

Again we say that cost will not keep electric house heating from people who want it. And people who want $50 coffee makers will buy them.

THE ELECTRICAL WEEK

The Issue's News Highlights—Pres Eisenhower's budget advocates "no new starts" for power generating projects, calls for TVA to shift AEC load to other suppliers . . . Interior's Upper Colorado proposals lack Budget Bureau approval as conservationists oppose Echo Park Dam.

Interior's Aandahl and NRECA's Ellis engage in federal power monopoly debate at association's annual meeting . . . Atomic submarine Nautilus was launched last week at Groton, Conn. . . . BEA reports Britain's kwhr bills are up 10% for residential customers.

Long-heralded Light's Diamond Jubilee TV show, two hours over three networks a la the Ford Anniversary Show, is now definitely scheduled to come off Oct. 21, 75th anniversary date of Edison's first practical incandescent lamp, the Jubilee committee announced. The show, estimated to cost close to a million dollars, will be financed half by power companies and half by electrical manufacturers. Produced by N. W. Ayer & Son, it will emphasize past and future electrical progress.

For the first time in history, power output went over the 9 billion mark with the week ending Jan. 16. Figure, 9,013,905,000 kwhr, was 11% above that recorded for the comparable week last year, EEI reported. Maximum winter peak for all U. S. utilities in 1953 was 81.2 million kw, 7.6% above 1952.

New York Transit Authority is pressing the city's Board of Estimate to decide on sale of transit power plants to Consolidated Edison Co, The New York Times reported. Con Ed said: "No negotiations are in progress." Transit Authority said: "No Comment."

From now on, when an employee completes 25 years of service at Con Ed, he'll get 5¢ more an hour. This will affect 12,500 employees immediately.

Britain hopes to generate all the country's electricity by atomic power within 20 years, the government announced. "Extensive studies," a white paper said, "have convinced scientists and engineers that nuclear energy should be able to make a substantial contribution to the electricity supply of the country at a cost comparable with the cost of coal-generated electricity."

Israel's Cabinet approved an agreement to buy control of the British-registered Palestine Electric Corp, which controls power in the country. It is understood the government would prefer not to buy all shares, but enter into partnership with the corporation.

Following initial operation of some of its new 330-kv lines at rated voltage, American G&E is conducting experimental operation on that and lower voltages to try to eliminate source or sources of R. I. factors higher than normally expected, AG&E announced.

Off the Washington Wire . . . Fiscal 1953 Rural Electrification Loan Program was the smallest since 1945. Advances on loans for year ending June 30 was $207.6 million—down nearly $20 million from 1952.

Senate Foreign Relations subcommittee has recommended a $3 million survey to determine economic feasibility of the Passamaquoddy Tidal Power project between Maine and New Brunswick, Can.

AEC may ask for supplemental funds to begin construction of a "package" nuclear power plant of about 30,000 kw. Plant probably would be used in a U. S. military base abroad where fuel costs are high.

BPA will ask for a $3.2 million supplemental appropriation early this year to begin building a transmission line to serve Harvey Machine Co's new aluminum plant near The Dalles, Ore.

There was a hint that power politics may be stirring in the Pacific Northwest. Paul Raver, who quit BPA to become superintendent of Seattle City Light, came out strongly for continued low rates at Bonneville in his "farewell" letter of transmittal of BPA's fiscal 1953 report. He also said he felt new starts on multipurpose projects were imperative—a view the present administration does not share.

City of Chicago announced it will appeal Illinois Commerce Commission approval of a 6½% rate increase for Commonwealth Edison Co and its Public Service Division.

Atlantic City Electric will pay a 5% stock dividend out of surplus on common shares to stockholders of record Feb. 5 . . . Kentucky Utilities on March 8 will pay a quarterly common stock dividend of 28¢ a share, compared with 25¢ in the previous quarter.

EEI's Transmission and Distribution Committee will study voltages in use and proposed for general secondary distribution and particularly the 460-V bracket for industrial and commercial buildings.

Illinois Tech's Armour Research Foundation will make a preliminary survey for EEI of factors in application of connectors to joints between aluminum or aluminum and copper conductors on overhead lines.

A. C. Monteith, Westinghouse engineering vice president, was nominated for the presidency of AIEE at the Institute's Winter General Meeting in New York.

Executive Changes—O. Titus, president of Pennsylvania Electric Co, was elected president of Metropolitan Edison Co to succeed the late W. H. Doran. Both companies are GPU subsidiaries . . . V. M. Marquis, vice president of system operation and planning for American G&E Service Corp, was promoted to vice president and assistant to the president.

Ike Buttresses "No Starts" Policy

- **Administration's $623 million budget for power purposes puts clamp on new generating projects**
- **Request is down $39 million from 1953 and includes only $4.5 million for new transmission line work**

First full-fledged budget of the Eisenhower Administration adheres rigidly to the "no new starts" policy for power generating projects.

Total spending for construction of all federal power facilities during the year beginning July 1 would be $623 million according to the budget presented to Congress late last week. This is an estimated $39 million under expenditures for the current year for these purposes, and $148 million less than requested by the previous Democratic Administration in its budget last year (EW, Jan. 19, 1953, p 6).

Main contribution of the Eisenhower Administration to fiscal policy last year was a series of patchwork revisions on the Truman budget which was submitted to Congress shortly before the Republicans took over. These revisions gave no more than a hint of the sweeping economies and policy changes evident in the document made public last week.

Not only is power development confined to work on projects already under way, but funds requested for new transmission line starts are limited to around $4.5 million—less than a fifth of the money requested by the Democratic Administration last year for new starts of this type.

Administration power policy was clearly the basis for the portions of the budget dealing with power development and marketing. In his message, President Eisenhower stressed the increasing role to be played by nonfederal agencies in providing the nation's electricity. As an immediate incentive, he urged that $10 million be appropriated to enable the Army Corps of Engineers and Bureau of Reclamation to assist state and local interests in developing water resources.

However, he hinted that economy goals were partially responsible for the "no new starts" policy, saying "needed projects to be constructed by the federal government may include those which, because of size and complexity, are beyond the means of local, public, or private enterprise."

"Where the necessary transmission facilities are not being provided on reasonable terms by other public or private agencies," the President said, "The Department of Interior will construct and operate transmission lines that are economically feasible . . ."

I Tennessee Valley Authority

TVA, only federal power agency which assumes a full utility responsibility to its customers, is headed toward an impossible power supply situation under the continuing "no new starts" policy. To avert this, the President seeks to shift a 600,000 kw portion of the Atomic Energy Commission load now carried by TVA to other suppliers.

AEC loads served by TVA are centered in the Oak Ridge, Tenn., and Paducah, Ky., areas. The President indicated that negotiations are or will soon be under way with electric companies operating in those areas to supply the 600,000-kw load by the fall of 1957. This would release TVA capacity to serve its other wholesale customers in the valley.

Should the negotiations fail, or new defense loads develop, the President said "the question of starting additional generating units by TVA will be reconsidered."

A proposal to be submitted later would require TVA to pay a reasonable rate of interest on the $803.4 million which the federal government has invested in TVA power facilities. Until now the agency has had the use of interest-free federal money for power expansion, but has returned an average of approximately 4% on the power investment.

The $141.8 million requested from Congress for the next fiscal year will be used to continue work on units at five hydroelectric projects and three steam plants. From previous appropriations the agency will be able to carry on a larger construction program than this figure would indicate.

II Southwestern Power Administration

No funds are requested for the controversial SPA continuing fund which Congress ordered abolished as of next month. This fund—$1.2 million for the current fiscal year—was used by the agency to purchase power and lease transmission facilities in connection with its marketing activities.

Funds for these purposes are now to come from SPA's operation and maintenance budget which runs to $1.03 million for the next fiscal year. For the current fiscal year, this item was $1.6 million, not including the rental and purchase activities.

The budget indicates the agency is working out exchange agreements which will require little or no direct appropriations. This course was suggested last year by several utilities which have contracts with SPA.

Construction money requested by SPA would provide facilities to connect some ten new wholesale customers during the year and to meet previous construction obligations.

Of the $1.45 million requested for Southeastern Power Administration, $1.2 million would go for payments on wheeling contracts with private and public utilities, remainder would be used for general administration. No construction funds are requested.

III Bonneville Power Administration

Bulk of the money asked for new transmission starts would go to BPA —$4 million of the total $4.5 million asked for new transmission starts. This would provide for initiation of the 230-kv Oregon City-Chemawa line in Oregon and transmission facilities in the Lewis County-Frenchman Hills area in Washington.

Remainder of the "new start" money would be used for additional units on existing lines. With the remainder of the $42.5 million requested for construction, work would be continued on lines already under way.

IV Reclamation and Engineers

Bureau of Reclamation is the only other power agency for which new

President's Federal Power Budget

Construction Expenditures

(Millions of dollars)

Agency	Fiscal 1954	Fiscal 1955
Corps of Engineers		
Multipurpose projects	282.7	223.1
Interior		
Reclamation Bureau		
Multipurpose projects	47.0	34.3
Transmission	21.1	17.6
Bonneville Power Administration		
Transmission	50.2	42.5
Southeastern Power Administration		
Transmission	....	....
Southwestern Power Administration		
Transmission	3.7	1.3
Tennessee Valley Authority		
Multipurpose projects	13.0	6.8
Steam-electric plants	192.0	243.3
Transmission	44.0	39.5
International Boundary and Water Commission		
Multipurpose projects	8.3	4.6
Aid for Non-Federal Projects		
By Corps of Engineers	....	5.0
By Reclamation Bureau	....	5.0
Totals	662.0	623.0

transmission starts are requested. These would be the Alcova-Gering line in Wyoming and Nebraska for which $325,000 is asked in fiscal 1955, and the Edgeley-Groton line in the Dakotas for which $250,000 is requested.

Continuing work by the bureau on multipurpose water projects will take an estimated $34.3 million.

With the $223.1 million requested for multipurpose Army Corps of Engineers projects, work would be continued on some 35 of these projects currently under construction. Construction would be stepped up on Table Rock Reservoir in Missouri and Arkansas.

Although the President asked for 23 new starts on water projects, none of these contained power features.

V Atomic Energy Commission

An additional $35 million was requested for development and construction of the nation's first utility-size nuclear power plant. Seven million dollars for this purpose was made available last year.

In his message, the President promised to propose legislation in the near future to revise present law to permit industrial development of atomic power. He said he would also propose a freer exchange of power reactor information with foreign nations, and possible transfer of fissionable material to friendly nations for use in their atomic power production program.

VI REA

Loan authority amounting to $55 million with contingency authority for an additional $35 million was asked for Rural Electrification Administration for the farm power program. A minimum of $200 million is now available for this program from previous authorizations.

Interior Snagged . . .

. . . on Upper Colorado by conservationists' opposition, lack of Budget Bureau clearance

Interior Department was running into trouble last week as it pushed for authorization of the first large-scale water power project under the Republican Administration.

The department could only submit its plans for the $1.1 billion Upper Colorado River Storage Projects to the House Interior & Insular Affairs Committee as hearings got under way. It could not recommend acceptance, since the plan had not yet been cleared by the Bureau of the Budget, which wields the White House seal of approval.

Conservationists were out in force to oppose the Echo Park unit of the huge project because it would be built in a portion of the Dinosaur National Park. Without this unit, it is doubtful whether the remainder of the project would be feasible.

Tudor Testifies . . . Interior Undersecretary Ralph Tudor took the witness stand first, testifying that Echo Park was by far the most suitable site for one of the key storage units of the project. He said he had conducted a personal survey of alternate sites and concluded that their more rapid evaporation rates ruled them out.

Sen Wallace F. Bennett (R.-Utah) submitted a statement to the committee favoring authorization of the project.

He took issue with conservationists arguing that Dinosaur National Park had been created with the understanding that future water and power development would be permitted. He contended that it would set no precedent to build Echo Park Dam within the park area because of this understanding.

Main units of the $1.1 billion initial phase of the project would be Glen Canyon, $421.3 million, and Echo Park, $176.4 million. The larger of these storage units would have a power plant with 800,000 kw of installed capacity. Echo Park power plant is planned for 200,000 kw.

Eight Other Projects . . . Eight other projects in later phases of the project would have a total installed capacity of 622,000 kw.

Cost of the two initial storage units recommended by Interior is estimated at $597.7 million. Of this, $98.3 million would be allocated to irrigation and other water consuming uses and $499.4 million to power. Cost allocations for the participating projects have not been finally determined.

Staff of the House committee considering the authorization calculates the benefit-cost ratio of the initial phase of the project at 1.64 to 1. This would mean that the annual benefits of the projects would exceed cost by that ratio.

It is estimated that repayment of the power allocation of the two storage units and one large subsequent unit can be accomplished by power revenues based on an average rate for firm energy of 6 mills per kwhr within a 50-year period from the date each power unit is placed in operation.

Westinghouse Gets BPA Order

Federal contract for large transformers is given to U. S. firm despite lower bids submitted by two foreign concerns

Government contract for a bank of large auto-transformers has been awarded to Westinghouse Electric Corp, although two foreign firms submitted lower bids.

The $771,346 contract is the most recent in a series of government purchases of large electrical equipment involving the "Buy American" act. But since the American firm was found by the purchasing agency, Bonneville Power Administration, to be the lowest bidder to measure up to technical requirements, the award was not a strict dollars and cents proposition.

The transformers with a step-down of 230,000-115,000-13,800 v are destined for the Big Eddy substation in Wasco County, Ore. Nominal rating of the bank is 150,000 kva and the force cooled rating is 250,000 kva. Specifications asking for bids stipulated the bidder must have had experience in design, construction, and testing of transformers in this higher voltage class. The two foreign firms have never completed equipment of this rating, although both have such transformers under construction.

The Bids . . . BPA announced receipt of these price and evaluated bids for the transformers:

Firm	Price Bid	Evaluated Bid
American Elin Co . . . . . (of Austria)	$558,600	$628,650
English Electric Co . . . (of Great Britain)	634,890	743,032
Westinghouse Electric Corp . .	771,346	883,615.20

In evaluating the bids, BPA considered the efficiency rating of the equipment and escalator clauses based on labor and material costs. For the foreign bids a 25% differential was added in accordance with "Buy American" regulations administered by Interior Department.

Another award for a lower-voltage bank of transformers is to be made in the near future by BPA. Again two foreign firms are lowest bidders.

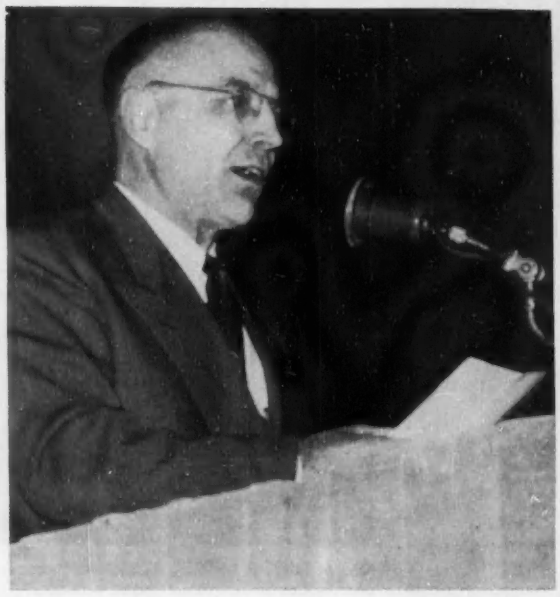
Asks Contract Suspension . . . In a related action, Sen George W. Malone (R-Nev.) demanded suspension of a contract awarded English Electric Export & Trading Co, a British firm, for two 73,684 kva generators to be installed at McNary Dam in Washington.

He said it should be cancelled unless Corps of Engineers explained what weight was given to wage loss to U. S. workers, to loss in U. S. revenues and taxes, to past performance and experience of bidders, and to repair and replaceability in time of emergency. He also asked, in view of the President's policy of federal-local cooperation, what state and municipal officials were consulted in connection with the award.

Plane Misses Tower, Fouls Lines

Engine failure on take-off sent a small two-engine plane ripping past transformer tower through two high voltage tower lines of Los Angeles Department of Water and Power in Burbank, Calif., on Sunday morning Jan. 10, causing wreckage shown above. The pilot walked away from wreckage, but co-pilot was seriously injured and a resident of one of two destroyed Burbank houses died of burns (EW, Jan. 18, p 5).

The plane pulled down all six conductors on a two-circuit 138-kv tower line and three of six conductors on an adjacent three-circuit line. No outage occurred on transmission system of Los Angeles Department of W&P, although the crippled aircraft and falling high voltage conductors interrupted service on 34.5-kv lines of the department and City of Burbank.



FROM THE ROSTRUM Fred G. Aandahl: "I am disturbed when I see . . . crusaders for a federal power monopoly, trying to use the electric co-ops and their associations to foster federal power monopoly."

FROM THE FLOOR Clyde Ellis: "I know of no one in rural America . . . who advocates a federal monopoly . . . At no time have I done or said anything I believe would give the impression I advocate it."

Wraps Come Off NRECA-Interior Fight

Floor skirmish between Clyde Ellis and Assistant Secretary Aandahl at Miami Convention points up sharp differences on rural electrification program

The snow storms that swept across vast portions of the country this month didn't quite reach as far south as Miami, Fla. But there were enough verbal snowballs thrown in that city during the week of Jan. 10 to make a winter.

Battleground was the Dinner Key Auditorium, where the National Rural Electric Cooperative Association held its 12th annual meeting of [5,865] members. Participating in the word flinging on and off the rostrum were persons of divergent political opinions. Backgrounding their efforts were hotel-corridor charges and countercharges that:

- Leaders in the Rural Electrification Administration were trying to sabotage NRECA's leadership.
- Interior Department was trying to sabotage the rural electrification program.
- NRECA was trying to make a political football of that program.

Not even "warm greetings" telegraphed to the meeting by President Eisenhower could quell the internecine squabbles.

Head-on Clash . . . Chiefly responsible for bringing the grappling to the surface were Assistant Interior Secretary Fred G. Aandahl and NRECA's Executive Manager, Clyde T. Ellis. The Interior official set off the storm that was still boiling as the meeting ended, when, during his prepared speech before a panel discussion on power supply, he asserted:

"I am deeply disturbed when I see those who even at this early stage are crusaders for a federal power monopoly try to use the rural electric cooperatives and their associations to foster federal monopoly."

Aandahl had quoted earlier from a speech Ellis had made in Portland, Ore., on Nov. 17, during which Ellis said:

"Appeals to Congress have been equally fruitless during the past several years. It seems practically impossible to impress upon the members that the government has assumed the responsibility of wholesale power supply and, therefore, must prepare to carry out its program and meet the demands of the area."

Aandahl stated that Ellis' opinion was such as "certainly point in the direction of a strong trend toward federal monopoly of the electric power business."

Ellis Retorts . . . Ellis was quick to counterattack. Before the final of the seven panelists made his preliminary statement Ellis grabbed a floor microphone to ask the Interior official to whom he was referring in the charges.

Replied Aandahl: "In that statement I mentioned no one by name. I referred to anyone who is promoting a government responsibility in supplying electrical energy in addition to that which comes from the hydroelectric plants that are associated with multipurpose water development projects, or the single purpose projects closely associated with them."

Countered Ellis: "I know of no one throughout all of rural America . . .

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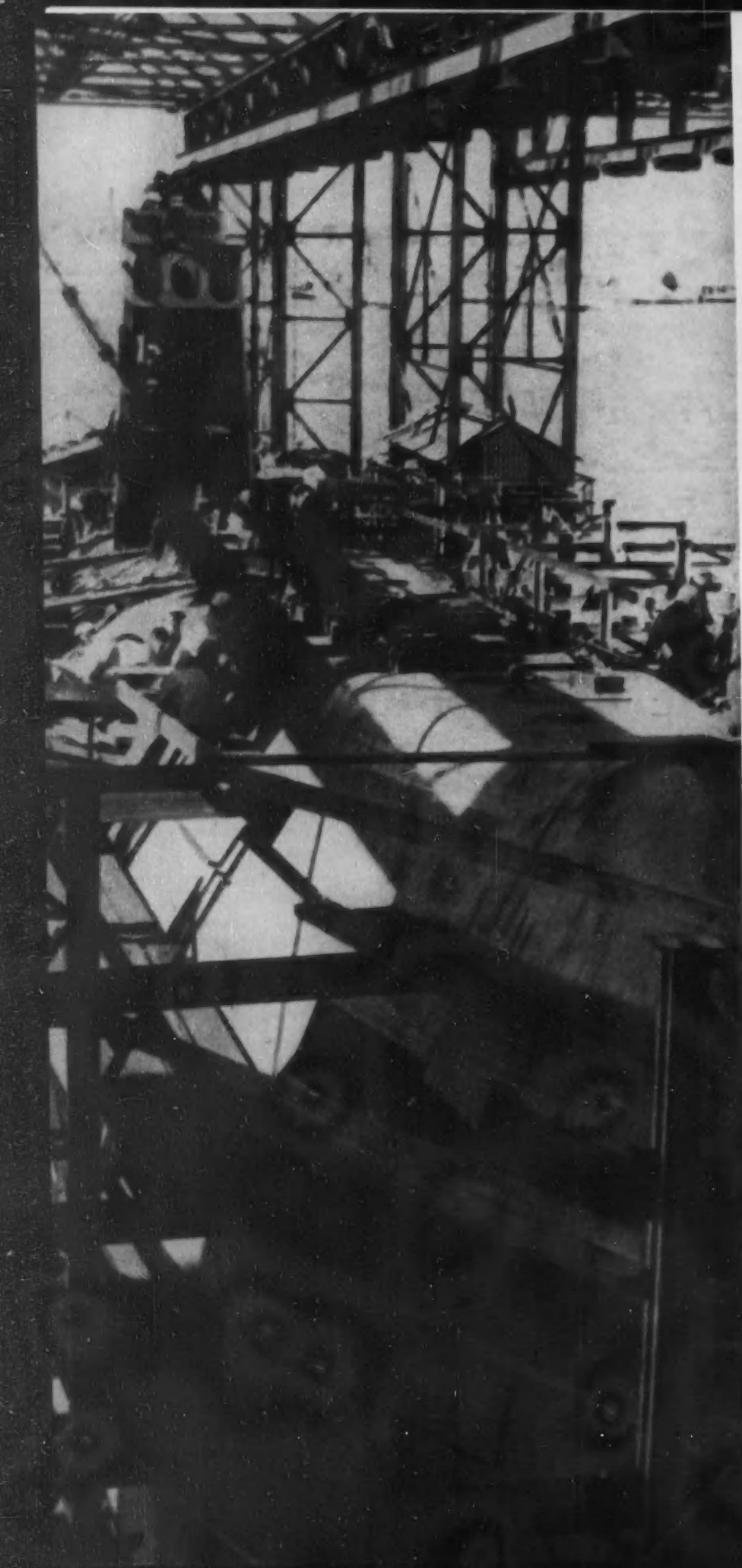
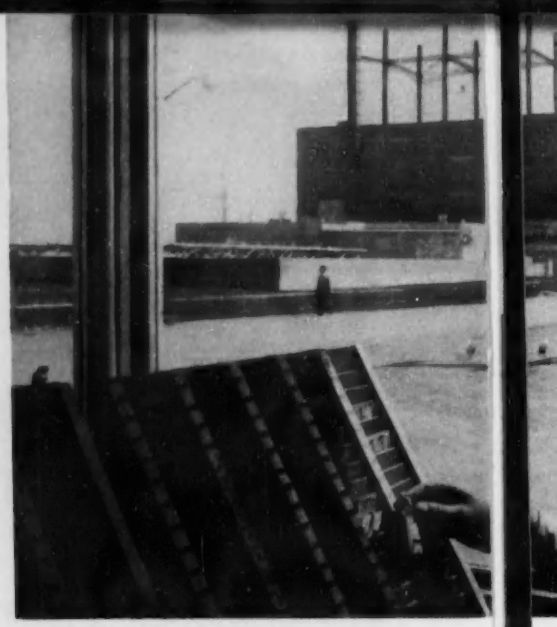




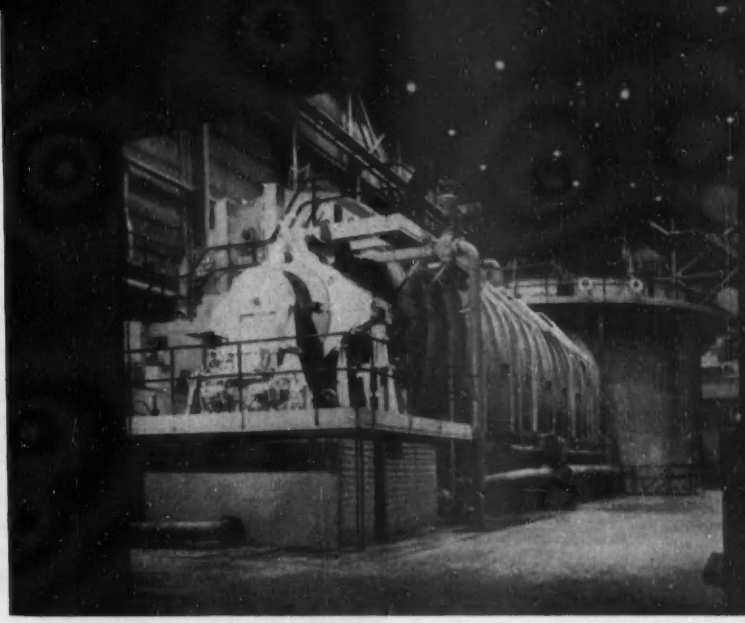
AEC SECURITY PATROL keeps unauthorized persons out of atomic engine test area

HEAT FROM SUB REACTOR, to be dissipated at sea in operating model, is released

Building

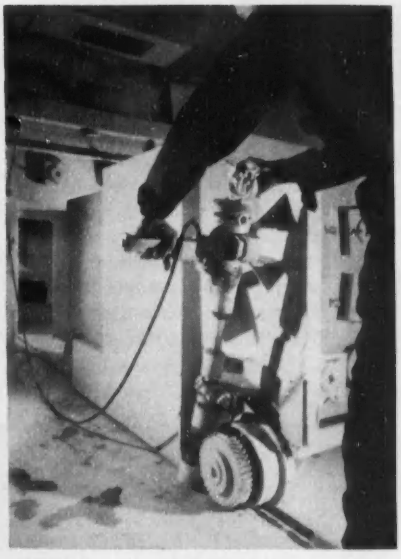
U.S.S. NAUTILUS, world's first atomic submarine, was launched last Thursday at Groton, Conn. Her engine, prototype of which was designed by Westinghouse, points the way toward commercial nuclear-fueled power plants. Picture shows sub's hull as it neared completion on the ways

Land-based prototype of "Nautilus" unit is housed in 8-story windowless building

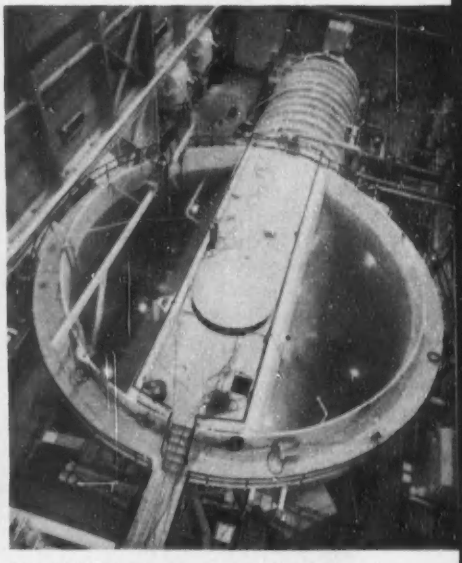


HERE'S A LOOK-IN at hull of "indoor submarine" with first atomic engine ever to produce substantial quantities of power. View shows aft end of hull passing through large "sea tank"

into the air in this 2-million gallon spray-pond near main building of test station



HOT CELL with walls 7 ft thick is used to handle radioactive material. The "door" weighs four tons



SEA TANK 50 ft in diameter and 40 ft high surrounds reactor compartment of "sub"

The Nuclear Chambered Nautilus

● The world's first atomic submarine was launched last week at Groton, Conn. (EW, Jan. 18, p 6). Christened "U. S. S. Nautilus," the Jules Verne-like undersea craft will be powered by an engine whose prototype was assembled in the middle of an Idaho desert. Under contract to Atomic Energy Commission, Westinghouse Electric Corp built the land-based experimental model (Mark I) in cooperation with Argonne National Laboratory at AEC's Bettis Plant near Pittsburgh, Pa. From there it was shipped to the National Reactor Testing Station in Idaho (See pictures, above), where it was assembled and tested. From information obtained, improvements were built into the Mark II, which will propel the Nautilus. This second atomic engine is expected to make her a round-the-world submarine, able to cruise great distances submerged at speeds above 20 knots. Meaning for industry: From this engine may develop tomorrow's atomic power plant.

High Praise for Technologists

Vice Admiral Bowen lauds engineers in speech before winter meeting of AIEE. Institute honors John Finley Peters

More than 5,000 engineers from North and South America, Europe, and other parts of the world gathered in New York last week for the winter general meeting of the American Institute of Electrical Engineers.

At the only general session of the week-long conference, John Finley Peters, consultant to Westinghouse Electric Corp, was presented with the institute's Edison Medal, one of engineering's top awards. This session, held Jan. 18, also featured speeches by Vice Admiral Harold G. Bowen, U. S. Navy, retired, and president of the Thomas A. Edison Foundation, and Elgin B. Robertson, AIEE president.

At the technical sessions 410 papers were presented on every branch of electrical engineering. Detailed account of these sessions of the meeting will appear in the Feb. 8 issue of Electrical World.

ADMIRAL BOWEN addresses conference

Relates History of Industry . . . In commemoration of the 75th anniversary of the first commercially successful incandescent lamp and the 50th anniversary of the establishment of the Edison Medal, Admiral Bowen devoted his speech to a brief history of the light and power industry.

Though James Watt, the Scotch inventor of the steam engine, "started the age of power," said Bowen, it was Edison who gave the engine "a boarding house reach" by providing a flexible and efficient means for distributing energy to any point where it was required.

Since their inception, the admiral pointed out, the light and power industry and electric manufacturing industry have developed and grown tremendously. He said that in 1950 the utility industry alone employed 294,000 people and that power generated reached 513 billion kwhr in 1953.

Contribution to Security . . . The retired naval officer declared that technology in the electric field has been a vital factor in developing the security of our country and attributed the nation's power network with "literally binding the country together into a powerful unit, great in peace and mighty in defense."

Bowen praised electrical engineers for their contributions to the nation's technical progress, made possible through application of electricity. He said: "It is the electrical engineer, working quietly in our utilities, our factories, our laboratories, and our universities and colleges as well as thousands of other places, who directs this great energy to the welfare of mankind."

The admiral predicted that the accumulated knowledge in the electrical field would be utilized to a greater extent to protect economic stability by creating new industry and new jobs.

In paying tribute to Peters, Bowen noted that the 1953 Edison Medal winner had never attended high school. While commenting that this was also true of such outstanding scientists as Farraday, Watt, and Edison, he said he did not recommend such a procedure for most young men striving to get ahead today.

Urges Infiltration Tactics . . . The naval officer said the engineering shortage is due, in part, to the fact that possibilities of a career in engineering and science are not emphasized sufficiently in elementary and secondary schools. This, he said, can only be accomplished when technologists work through local school boards as members. He added: "Technologists owe it to themselves, to industry, and to their country to infiltrate all sources of education because it is a notorious historical fact, in times of great change, educational institutions do not satisfy current requirements and must be subjected to outside influences."

EDISON MEDAL is presented to John Peters by AIEE Pres Elgin Robertson. Looking on are A. C. Monteith (left) who spoke on Peters career, and J. F. Fairman who related medal's history

Bowen declared that technology had accomplished more for civilization than all other efforts of the human race. He noted that technology had eliminated slavery by making it unprofitable whereas edicts had failed to abolish it. Finding solutions to the problems created by technology, Bowen said, is the job of the liberal arts profession, social scientists, and government.

In a final prediction, the admiral declared, "War will continue until all mankind is convinced that technology has made war unprofitable for all participants."

President's Report . . . In his report to the meeting, AIEE President Robertson also praised electrical engineers for their part in making the U. S. the most technically advanced country in the world. He said that AIEE is primarily a technical organization and has done a good job in the accumulation of technical knowledge.

To illustrate the institute's rapid growth, he noted that the winter general meeting of 1924 attracted 1,600 persons and that 20 technical papers were presented. This compares with an attendance of 5,000 this year with 410 papers presented.

In accepting the Edison Medal, Peters made a short speech in which he urged older engineers to help young engineers understand the importance of basing their technical careers on a sound knowledge of fundamentals before they turn to specialization. He emphasized that the older men should encourage the younger men to seek their advice and that they should have faith in the abilities of new engineers and respect their fresh viewpoints.

Peters was named to receive the AIEE award in December (EW, Dec. 28, '53, p 66) and was cited "for his contributions to the fundamentals of transformer design, his invention of the Klydonograph, his contributions to military computers and for his sympathetic understanding in the training of young engineers."

Utility Grants Pay Boost

Southern California Edison Co has granted a general wage and salary increase to all its employees. The increase, effective Jan. 1, amounts to 5¢ an hour for some workers and a 4.3% boost for others, except for selected supervisory and management personnel.

Ernest C. Gaston . . .

. . . Wins Kwhr Pool

Estimate of 1953 output by Southern Services vice president is off by only .08%

Ernest C. Gaston, vice president of Southern Services, Inc, came within .08% of racking up a perfect score in the 1953 Kwhr Power Generation Pool which drew 325 entries. His estimate of electrical output for 1953 was 441,682 million kwhr compared with Federal Power Commission's recently announced figure of 442,014 million kwhr.

The contest is conducted each year by Robert M. Hatfield, Jr, vice president of Combustion Engineering, Inc.

Close behind Gaston was Stanley Moyer, assistant mechanical engineer of Philadelphia Electric Co, whose estimate was off by about .1%. In third place was A. J. Beck, Detroit Edison Co standards engineer. Fourth place honors went to Henry B. Sargent, president of Arizona Public Service Co, and only one of the 35 utility presidents competing in the contest to qualify as a winner. Sargent came in 7th in the 1951 pool.

Ladies Make a Showing . . . Fifth and seventh place winners in this year's contest were women. Mary Maynard, Union Electric Co of Missouri, came in fifth and Patricia Van Derra, who placed fourth in 1951, was seventh. Miss Van Derra works for Interior Department, in the Office of the Secretary.

Consistent sixth place winner is Fred Compton, Detroit Edison Co vice president. He was sixth this year and also in 1950 and 1949. In eighth place was Russ Parkinson, chief engineer, Commonwealth Associates. His guess was .2% out of the way.

All eight winners will receive diplomas conferring upon them the honorary degree of "Master in the Art of Load Forecasting."

Entries for the 1954 pool are being accepted now and must be sent in by the end of February.

Louis V. Sutton Is Named 'North Carolinian of '53'

Louis V. Sutton, president of Carolina Power & Light Co has been named "North Carolinian of 1953" for his contributions to the industrial and commercial development of North Carolina in the areas of greatest need.

The former Edison Electric Institute president was selected by a committee of 12 judges. Among the accomplishments influencing the election of Sutton were:

1. His company, in the face of inflationary price increases, held the line on power rates, a factor in some types of industrial expansion.

LOUIS V. SUTTON

2. He guided the building of Carolina P&L's largest generating plant near Wilmington, assuring ample power for prospective industry. This plant was part of a company program which in ten years is investing $200 million in the two Carolinas.

3. He launched a territory-wide "Finer Carolina" program to stimulate community betterment, civic improvements, and soil and water conservation.

PUBLIC RELATIONS & ADVERTISING

Which Gets the Audience – Radio or TV?

Hour of Day*	Number of Sets in Use		Percentage of Sets in Use	
	Radio	Television	Radio	Television
Radio leads in the morning, has 11 AM peak . . .				
6– 7 AM	1,477,000	51,000	3%	—
7– 8	3,625,000	385,000	8	2%
8– 9	4,565,000	745,000	10	3
9–10	4,923,000	1,259,000	11	5
10–11	5,595,000	2,518,000	13	10
11–12	5,684,000	3,111,000	13	12
12– 1 PM	5,460,000	3,880,000	12	15
1– 2	5,415,000	3,674,000	12	14
2– 3	5,057,000	4,008,000	11	16
Then for two hours the battle is close . . .				
3– 4	4,923,000	4,496,000	11	18
4– 5	4,655,000	4,521,000	10	18
But TV finally sweeps ahead for a 9 PM peak.				
5– 6	4,700,000	5,498,000	10	21
6– 7	4,297,000	6,448,000	10	25
7– 8	3,401,000	8,298,000	8	32
8– 9	2,551,000	12,794,000	6	50
9–10	2,730,000	14,361,000	6	56
10–11	2,551,000	13,205,000	6	51
11–12	1,835,000	9,120,000	4	36

*Study was made in September, 1953.

Radio Losing Audience to TV

The battle for an audience between the long-established radio and the fast-growing television has reached a stage where the winner is clearly indicated. It will be television. But radio is fighting so gamely that it may be years before it can be crowded from the advertiser's budget.

TV is now supreme after 5 PM; that is, there are more TV sets than radios tuned in after that hour (See table). From 3 until 5 PM the numbers are nearly equal. From 6 AM until 3 PM radio has control. But the key factor that will send radio down to defeat is the number of sets in operation. Last October there were 44,756,000 radios in U. S. homes, only 24,690,000 TV sets. And television sets are selling fast (See Sales and Service Department).

These findings are based on a report prepared by Nielsen Radio-TV Service for N. W. Ayer & Son. The advertising agency handles the account of the Electric Companies Advertising Program.

The Nielsen study showed that "You Are There," ECAP's television show, consistently captured over 30% of all homes which had their sets turned on in the areas where the program could be viewed.

A study last October-November revealed that only one of five similar programs had a larger share of the TV audience. "See It Now" had 34.9% to "You Are There's" 31.8%. And on a cost per thousand basis "You Are There" was third from the bottom. It was followed by "Meet the Press" and "Life Is Worth Living."

Nuclear Power Plant Posters Now Available

Utility company employees who are being questioned by the public on the method of manufacturing electricity in a nuclear power plant may find useful a schematic drawing of such a plant. One is available with the various pieces of equipment in color and plainly labeled. Size is 30 by 40 in.

The posters can be purchased from the Bishop Publishing Co, 168 N. Clinton Street, Chicago 6, Ill.

ECAP Announces TV Shows for February

February telecasts of the Electric Companies Advertising Program's "You Are There" show will be "The Hanging of Captain Kidd," Feb. 14, and "The Rise of Adolf Hitler," Feb. 28. The latter show is a repeat performance.

Prudential Life Insurance Co of America, sponsor of the program on alternate Sundays, will present "The Ordeal of Tom Paine," on Feb. 7, and on Feb. 21 "The First Command Performance of 'Romeo and Juliet'" will be televised.

SCANNING THE ADS

Alabama Power Co—"Sometimes going to bed seems like this (That is, unless you have an electric blanket)." This was the headline on an ad illustrated by a pajama-clad man in bed surrounded by four big cakes of ice.

New York State E&G Co—"Help Mama" has been the theme of a lengthy series of ads. During this period readers have been advised to "Help Mama" by getting her all of the major and some of the minor appliances.

Northern States Power Co—Live copy filled an ad inviting the public to inspect a new power plant. Sample block of headline copy: "See the boiler 9 stories high! Tornado of fire in giant furnace! Magic electric-brain control board! Generator powerful enough to light 90,000 homes! All in action in this $7,500,000 plant addition!"

Philadelphia Electric Co—"I love church work, and my new freedom gives me more time for it!" Naturally this housewife gets her freedom by electric living.

Southern California Edison Co—A quick way to prove to customers just how little electricity costs them is to ask them to divide the monthly bill by the number of days the bill covers. As the company bills every 60 days, its ad says, "Divide your two-month bill by sixty."

WASHINGTON COMMENT

JESSE MOCK

Dig down below the surface arguments on Administration power policy and you'll find the central issue is this:

Does the federal government have a utility responsibility to supply electric power to certain priority customers in favored areas?

The Issue: Does U. S. Have Utility Responsibility?

The customers in question are, of course, those given preference in the purchase of power from federal projects—the rural electric cooperatives and public bodies in the power business.

The areas are those in which federal hydroelectric projects have been built because of favorable sites or for other reasons.

On no other issue in the power field does the present Republican Administration differ so widely from its Democratic predecessors as on that of utility responsibility.

In its Interior power policy statement issued last Aug. 18, the Administration made clear its position:

"The department does not assume that it has the exclusive right or responsibility for the construction of dams or the generation, transmission and sale of electric energy in any area, basin, or region."

Big Difference . . . This was a far cry from the position taken by the late Democratic Interior Secretary Harold L. Ickes. In a policy memorandum issued early in 1946, Ickes wrote:

"The (federal) project shall have its own steam standby and reserve facilities where necessary to independent operation on an economical and efficient basis. Facilities shall be designed and installed to provide the type of power and service required by public agencies and co-ops."

Under the Democrats, the federal government did assume a full utility responsibility in the Tennessee Valley area, and to a slightly lesser degree in the Bonneville Power Administration area. Through use of extensive transmission systems, withdrawal clauses in power sales contracts with non-preference customers, and huge hydroelectric construction programs, the Democrats went as far as legally possible to take on this utility responsibility.

During this period, the public bodies and rural co-ops acquired a vested interest in the paternal policies of the government on power matters. For a number of reasons, the power from federal projects was usually cheaper than from other sources. Some of the preferred agencies used this business advantage to cut into the service areas of privately owned utilities. In the TVA area, for instance, private utility operations were bought out.

Talk of Federal Control . . . There was serious talk of regional—even national—transmission systems under strict federal control. Lack of economic water power sites appeared to limit conventional federal expansion in the power field. But by switching to huge steam-electric plants, as TVA did, these limitations on federal expansion were largely removed.

Once the government assumed utility responsibility in an area, the only real limitation was in money available for power expansion. Since Congress continues to hold the federal pursestrings, this proved a formidable obstacle. During the last seven years, there has been a growing tendency in Congress to trim expenditures for power expansion.

Except for TVA, which continued to be a pet agency, the Democrats had plenty of trouble living up to the utility responsibility they had assumed. In the power-short Pacific Northwest, it became clear to public and private power advocates that the undependable appropriation process was simply no way to run a power system. They talked of some alternative which would hinge on more local financing.

When the Republican Administration came in last year, it announced a clean break with the utility responsibility philosophy.

As might be expected, those with vested interest in such a policy raised howls all over the country. Sometimes these attacks were veiled under accusations that the GOP was undermining the preference clause. More often it appeared as charges that the new Administration favored private power at the expense of rural co-ops.

If it can be made clear that the utility responsibility philosophy is the main issue, both sides will be in a better position to present their arguments for public consideration.

TECHNICAL NOTES

ARCHER K. KNOWLTON

Annual tonnage production of coal is 4 times the tonnage of all grain crops, 200 times the tonnage of cotton and 6 times the iron-ore tonnage.

Tinplate research resulted in reduction by nearly half in 1952 of the 47,000 tons of tin used in 1941 even though 18 billion more cans were produced.

Transformer noise arises from magnetostriction, resonant components, vibrations at core gaps and joints, vibrations caused by interaction between core and coils and also vibration of the coil conductors carrying current.

Gas-detector relays have proved to be a reliable and fairly cheap means of providing fast and accurate protection of transformers.

Rugged positive-acting contact device to detect stoppage of coal is urgently needed to prevent injection of the pulverized coal into the boiler furnace except when combustion conditions are proper and safe.

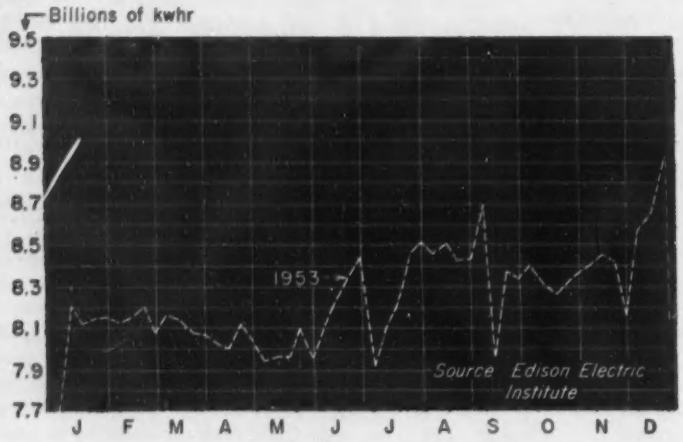
Greensalt preservative treatment may actually result in some increase in bending strength of southern pine poles.

Control and protective devices are probably superfluous (may even be dangerous) if no one can remember or explain what prompted their adoption.

Molybdenum disulphide is softer than graphite and its lubricating properties are attributed to its buttered-slice-of-bread molecular structure, namely two layers of sulphur with a layer of molybdenum molecules between them.

Carrier is hardly suited to power cable channels largely because of the low (25-ohm) characteristic impedance by comparison with the (500-ohm) value for typical overhead lines. Attenuation lose in db per mile may be 20 to 60 times that for an overhead line.

STATISTICS



Output Week Ended Jan. 16—9,013,905,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Jan. 16	+11.0	+7.4	+6.9	+3.0	+10.1	+22.2	+8.9	+11.0	+31.1	+11.4
Jan. 9	+7.8	+4.3	+5.4	−0.3	+6.0	+17.5	+5.6	+9.7	+26.9	+8.7
Jan. 2	+6.3	+1.8	+2.6	−1.3	+6.6	+14.8	+4.5	+8.3	+28.9	+5.0

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Oct.	76.9	77.2	71.1
Capacity (Million Kw)	Nov.	89.81	88.62	80.91
Production (Billion Kwhr)	Oct.	37.61	37.04	34.87
Hydro	Oct.	7.14	7.59	7.02
Fuel	Oct.	30.48	29.45	27.85
Fuel Consumption				
Coal (Million Tons)	Nov.	10.17	10.22	9.95
Oil (Million Barrels)	Nov.	6.91	6.78	7.77
Gas (Billion Cu Ft)	Nov.	81.13	96.85	69.17
Sales (Billion Kwhr)	Oct.	32.21	32.64	30.15
Residential	Oct.	8.70	8.55	7.72
Commercial	Oct.	5.62	5.90	5.09
Industrial	Oct.	15.56	15.67	15.16
Other	Oct.	2.33	2.51	2.17
Net Income Class A & B Companies ($ Million)	Nov.	84.99*	76.19	80.63
Estimated Dec. '54 Peak (Million Kw)	Oct.	94.8	95.0	95.7
Kwhr per Residential Customer (12 Month Average)	Oct.	2,318	2,303	2,144
Revenue per Kwhr Residential Service (12 Month Average)	Oct.	2.75¢	2.76¢	2.77¢
Canadian Production (Billion Kwhr)	Oct.	5.51	5.09	5.42

Business Statistics

FRB Industrial Production Index†	Nov.	130*	132	133
Gross National Product Annual Rate ($ Billion)	3rd Qtr.	369.0	372.4	345.3
EW 4 Industry Production Index†	Nov.	122.1	124.0	124.1
ENR Construction Cost Index††	Jan.	128.7	128.2	123.1
BLS Consumer's Price Index	Nov.	115.0	115.4	114.3
NEMA Insulation Materials, Sales Index†	Nov.	130	154	155
NEMA Electric Appliance Sales Index†	Nov.	70	91	100
NEMA Household Refrig. Sales Index†	Nov.	35	46	77
Metal Prices (Jan. 19)				
Copper, Conn. V., lb		$.29½-.30	.29½-.30	.24¼
Lead, N. Y. lb		.13	.13½	.14
Zinc, prime Western E. St. Louis, lb		.09½	.10	.12½
Tin, Straits, qual. N. Y., lb		.84½	.85	1.21½
Aluminum, ingot, base price		.21½	.21½	.20
Nickel, base price		.60	.60	.60
Steel, billets, Pitts., ton		62.00	62.00	59.00
Steel, scrap, No. 1 heavy, Pitts., ton		30.00	35.00	46.00

*Preliminary **Revised †1947-49=100 ††1949=100

EEI's New Index of Electric Output

On Wednesday, Jan. 13, Edison Electric Institute first issued its new weekly index of electric output of the total utility industry. The figure was 158.9, practically 60 points above the base period of 1947-1949, where the average output has the index value of 100.

Choosing that base enables comparisons with the Federal Reserve Board's newly revised Industrial Production Index, the American Iron and Steel Institute's index of steel output, the Consumer's Price Index, and other governmental or industrial indexes all keyed to the years from 1947 to 1949. With this, the electric power industry's place in the over-all economy is for the first time furnished with a true tool for comparison.

Output Index—1947-49=100
Seasonally Adjusted

Week Ended		Year Ago
Jan. 16	163.1	147.0
Jan. 9	158.9	148.0
Jan. 2	159.4	148.2
Dec. 26	158.8	148.5

The new index is a complete one. It not only measures manufacturing and industrial use of energy, but includes residential, commercial, agricultural, transportation and other uses which actually combine to account for more than half the total energy produced.

Output itself is defined by EEI as "electrical energy available for distribution from the output of all generating plants contributing to the public supply. This comprises the total electric utility industry which includes investor-owned companies, cooperatives and government-owned utilities but it excludes industrial, railroad and other plants which generate electricity for private use."

The index results from adjusting the weekly reported output values for normal seasonal and holiday variations, expressing the adjusted values as per cents of the base years' average. In this way, it will reflect the growth of the industry and the effects of changing business conditions, major work stoppages, and abnormal or non-seasonal weather. Because the index will be available within four days after the close of each calendar week, it will be one of the most timely available.

Britain's Kwhr Bills Up 10% . . .

. . . for average residential customer while United States home user pays approximately 7% less per kilowatthour

Since nationalization of the power industry in 1948, Britain's residential customer has had to pay approximately 10% more for the service while in the United States there was a decline of nearly 7% in the price per kwhr for the average residential consumer. This is shown in the table below by comparing the fifth annual report of the British Electricity Authority for the fiscal year ended March 31, 1953, with the Class A and B electric companies of the U. S. reporting to the Federal Power Commission for the year ended Dec. 31, 1952.

Residential Revenues . . . There appears to be little doubt that the American consumer, especially the residential customer, got an exceptional "break" compared with the British home user. A comparison was made of residential revenues for the period ended March 31, 1938, or substantially the last full year before the outbreak of World War II, 1948 the year of nationalization, and the last available fiscal year, namely, March 31, 1953. Comparable U. S. data is for the calendar years ended Dec. 31, 1937, 1948, and 1952.

In spite of the war years, the residential customer in Britain in 1948 enjoyed a reduction of 13.5% in the price per kwhr compared with what he had to pay in the 1937-1938 period. The subsequent rather substantial increase of 10.3% was registered entirely during the period that the industry has been socialized. In the same period the American consumer had his average price reduced 6.8%.

Commercial Revenues . . . As to commercial revenues, again it will be noted that the customer in Britain paid fractionally less per kwhr in 1948 than he did in the earlier pre-war period. Again subsequent increase of 3.2% although a modest one, took place entirely during the period of nationalization. In the United States the commercial customer, who certainly did not suffer unduly from inflation, had the price of his service reduced 4.5% from the 1948 level.

Industrial Revenues . . . With regard to the industrial group of customers, they were hardest hit by increases both before and after nationalization. In 1948 the average price per kilowatthour sold had increased 46.7% over the 1937-38 level. A further substantial increase up to 1952-1953 of 14.8% occurred after the industry had become socialized.

Even though fuel costs increased sharply there was a small decline of 1% in U. S. revenues. The large increases in the cost of fuel (principally coal) in Great Britain as well as the necessity to use a substantial amount of antiquated and inefficient plant were factors contributing to rise.

Residential Kwhr Sales . . . The residential kilowatthours shown in the table are highly significant in that the maximum growth in Britain took place principally during the war years and for three years immediately thereafter and was substantially in excess for the comparable period for the U. S. In the years following socialization and up to March 31, 1953, the position reversed itself radically with the U. S. investor-owned electric companies growing 61% over 1948 while Britain increased only 24%.

While the lower purchasing power of customers coupled with certain retric appliances may have had a restrictive effect on the growth of British residential use, it should not be forgotten that as an offset the use per residential customer in that country was historically much lower and that, consequently, the area of growth much greater than with the U. S. companies.

In this connection, it is of interest to note that for the year 1951, U. S. residential use per customer amounted to 1,910 kwhr per annum compared

U.S., Britain's Rates and 'Kwhr' Sales

	Revenues		Kwhr Sales (Billions)	
Residential	Britain Pence Per Kwhr	U. S. ¢ Per Kwhr	Britain	U. S.
1937 — 1938	1.522	4.36	4.3	14.8
1948	1.316	3.06	13.1	39.6
'48 over '37-38 — %	13.5%*	29.9%*	205%	167%
1952 — 1953	1.452	2.85	16.2	63.6
'53 over '37-38 — %	4.5%*	34.5%*	278%	329%
'53 over '48 — %	10.3%	6.8%*	24%	61%
Commercial				
1937 — 1938	1.793	3.37	2.7	16.9
1948	1.773	2.85	4.4	36.2
'48 over '37-38 — %	1.1%*	15.4%*	63%	114%
1952 — 1953	1.829	2.72	7.3	51.5
'53 over '37-38 — %	2.0%	19.2%*	171%	205%
'53 over '48 — %	3.2%	4.50%*	67%	42%
Industrial				
1937 — 1938	.646	1.11	9.5	48.3
1948	.948	1.08	19.0	103.8
'48 over '37-38 — %	46.7%	2.6%*	100%	117%
1952 — 1953	1.088	1.07	25.9	139.0
'53 over '37-38 — %	67.3%	3.5%*	173%	188%
'53 over '48 — %	14.8%	1.0%*	37%	34%

* — Decrease

to 1,350 kwhr in Britain. The 1952 U. S. residential use was 2,069 kwhr while that of Britain was 1,326 kwhr. Not only did average U. S. use advance 159 kwhr in 1952, or 8.1%, while that of Britain fell 1.7%, the use of electricity in this country per residential customer was 56% greater.

Commercial Kwhr Sales . . . Considering the economic stringencies prevailing in Great Britain from 1948 to 1952-53, the rate of increase in the commercial classification compared with that of the U. S. is interesting. It can be attributed in part to the restrictions imposed by the war years, and the need to make up for these losses, and in part to higher lighting and power standards being installed in the new commercial establishments in Great Britain. In addition, the higher post-war rate compared with the U. S. reflects generally an appreciation of bringing all customers to more acceptable standards of electric power usage.

Industrial Kwhr Sales . . . The analysis in the table appears to indicate that in Britain the use of industrial power has grown at a substantial rate in spite of the large increases in the cost per kilowatthour. The pressures to export into a competitive world market have undoubtedly been a factor in the rate of increase, coupled with the restrictions placed on the installation of private plant and the consequent need for Britain's industries to take their requirements from the nationalized public utility industry. In spite of that the annual use per industrial customer amounted only to 164,000 kwhr in Britain in 1952-53 compared with the United States usage of 660,000 kwhr. The United States figure is four times as much as the British one.

Conclusions . . . The general conclusions which can be drawn from the foregoing brief analysis is that since Britain's industry has been socialized a substantial burden of increased rates has fallen on the residential customer compared with the decreases which have accrued to domestic customers of the business investor electric companies in the U. S. In addition, the residential customer's participation in total sales which amounted in Britain to 34.1% in 1948 has decreased to

(*Continued on page* 279)

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1954									
Jan. 14	**3.01**	**3.05**	**3.26**	**4.10**	**4.17**	**4.57**	**5.03**	**5.48**	**5.50**
Jan. 7	3.03	3.10	3.30	4.14	4.21	4.59	5.06	5.51	5.50
END OF QTR.									
4th 1953	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51
3rd 1953	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.97	6.01
2nd 1953	3.34	3.46	3.64	4.47	4.70	4.88	5.52	5.93	6.10
1st 1953	3.15	3.23	3.39	4.16	4.41	4.66	4.95	5.24	5.50

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months	Ended	Net Income 1953	Net Income 1952	Earnings Per Common Share 1953	Earnings Per Common Share 1952
Consolidated Gas Electric Light and Power Co. of Baltimore	11	Nov.	$9,256,000	$8,891,000	$1.59(a)	$1.58(a)
Pacific Power & Light	12	Nov.	4,470,070	4,338,871	....	....

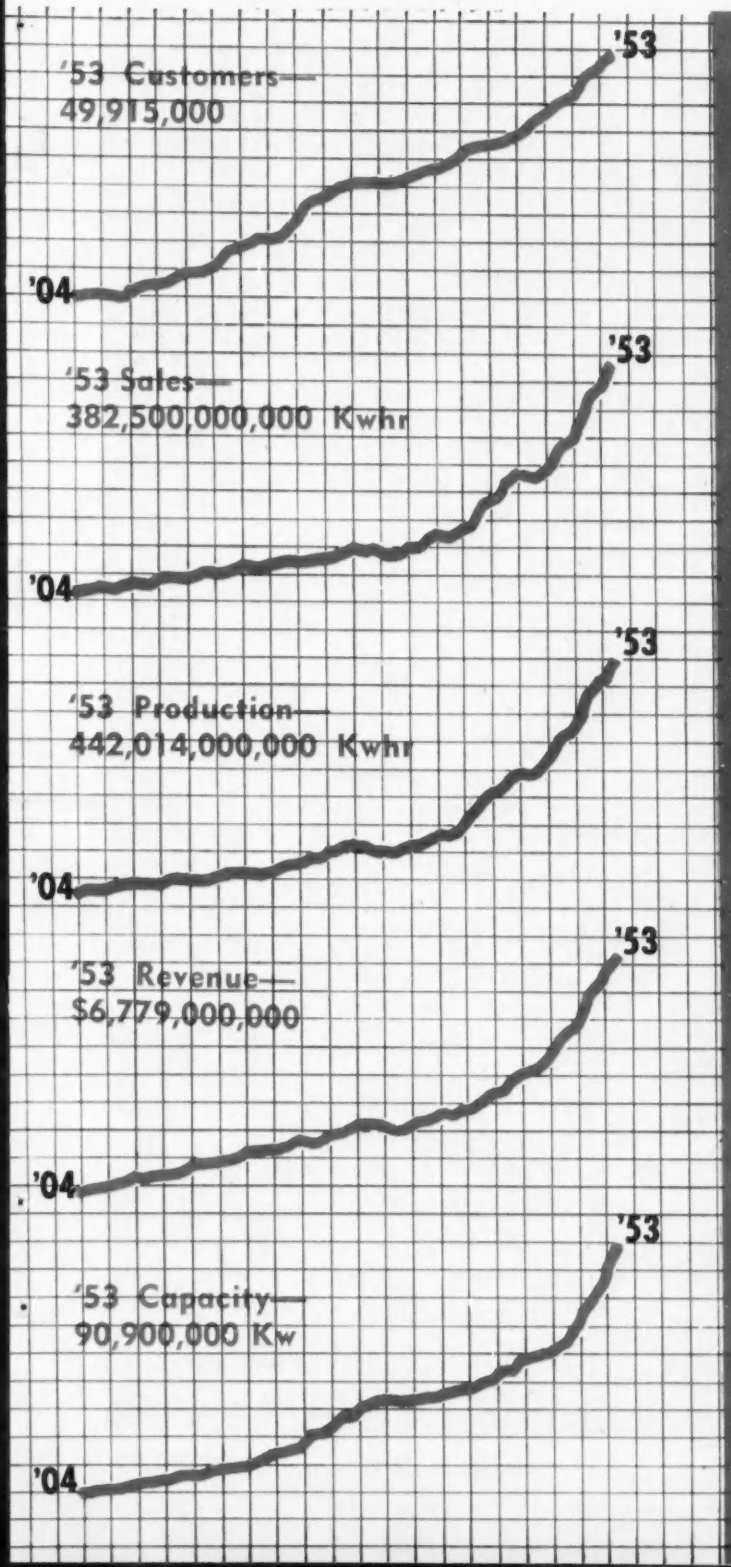
Note—(a) Based on average shares outstanding.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF JANUARY 14-20			
Bonds			
Ohio Edison—1st mtg 3¼% due 1984	$30,000	101.93%	3.15%
Preferred Stock			
Kansas City Power & Light—70,000 sh 4.20% $100 par	$7,000	$101.00	4.16%
Iowa-Illinois Gas & Electric—40,000 sh cum 4.22% $100 par	4,000	100.00	4.22
Common Stock			
Ohio Edison—527,820 sh (being offered commonholders on 1-for-10 basis, record Jan. 14 to expire Jan. 29 with an oversubscription privilege)	$18,870	$35.75	6.15%
Kansas City Power & Light—225,460 sh	7,327	32.50	5.54
Northern Indiana Public Service—315,961 sh (being offered commonholders on a 1-for-10 basis, record Jan. 8 to expire Feb. 3)	8,294	26.25	6.10%
SCHEDULE FOR JANUARY—FEBRUARY—MARCH—APRIL			Bid Date
Bonds			
Glendale, Calif.—electric revenues due 1955-74	$1,000	.....	Jan. 25
Public Service Co of Oklahoma—1st mtg due 1984	12,500	.....	Feb. 8
Louisville Gas & Electric—1st mtg	12,000	.....	Feb. 16
Pacific Gas & Electric—1st mtg due 1984	60,000	.....	Feb. 16
Essex County Electric—1st mtg due 1984	5,000	.....	Feb. 17
Suburban Electric—1st mtg due 1984	4,000	.....	Mar. 3
Alabama Power—1st mtg due 1984	17,000	.....	Mar. 16
Georgia Power—1st mtg due 1984	11,000	.....	April 6
Community Public Service—1st mtg due 1984	3,000	.....	.....
Debentures			
Otter Tail Power—convertible debs 4¼% due 1964 (to be offered commonholders on the basis of $4 principal amount of debs for every one share of common, record Jan. 25 to expire Feb. 8)	$2,500	$100.00	4.25%
Utah Power & Light—debs	15,000	.....	.....
Preferred Stock			
Mississippi Power & Light—60,000 sh $100 par	6,000	.....	Feb. 2
Common Stock			
Utah Power & Light—about 200,000 sh	$.....	.....	.....
Black Hills Power & Light	300(e)	.....	.....
Southwestern Public Service—272,500 sh (to be offered commonholders on a 1-for-14 basis, record Feb. 1 to expire Feb 16)	.....	.....	.....
Missouri Public Service—527,865 sh (to be offered commonholders on a sh-for-sh basis, record Feb. 11)	.....	.....	.....
POSTPONED, UNSCHEDULED, AND/OR UNDER CONSIDERATION			
Bonds			
Southwestern Public Service—1st mtg	$12,000(e)	.....	.....
Houston Lighting & Power—1st mtg	25,000	.....	.....
Public Service Co of Colorado—1st mtg	15,000	.....	.....
Brazos River Authority, Tex.—electric revenues	66,000	.....	.....
Jersey Central Power & Light—1st mtg	6,000(e)	.....	.....
Metropolitan Edison—1st mtg	3,500(e)	.....	.....
New Jersey Power & Light—1st mtg	3,000(3)	.....	.....
Pennsylvania Electric—1st mtg	12,500(e)	.....	.....
Preferred Stock			
Southwestern Public Service	$3,000(e)	.....	.....
Common Stock			
Iowa-Illinois Electric & Gas	$6,000(f)	.....	.....
General Public Utilities—about 600,000 sh (to be offered on a 1-for-15 basis)	.....	.....	.....

Notes—(e) Estimated; and (f) To sell enough common stock to yield $6 million.

INDUSTRY STATISTICS



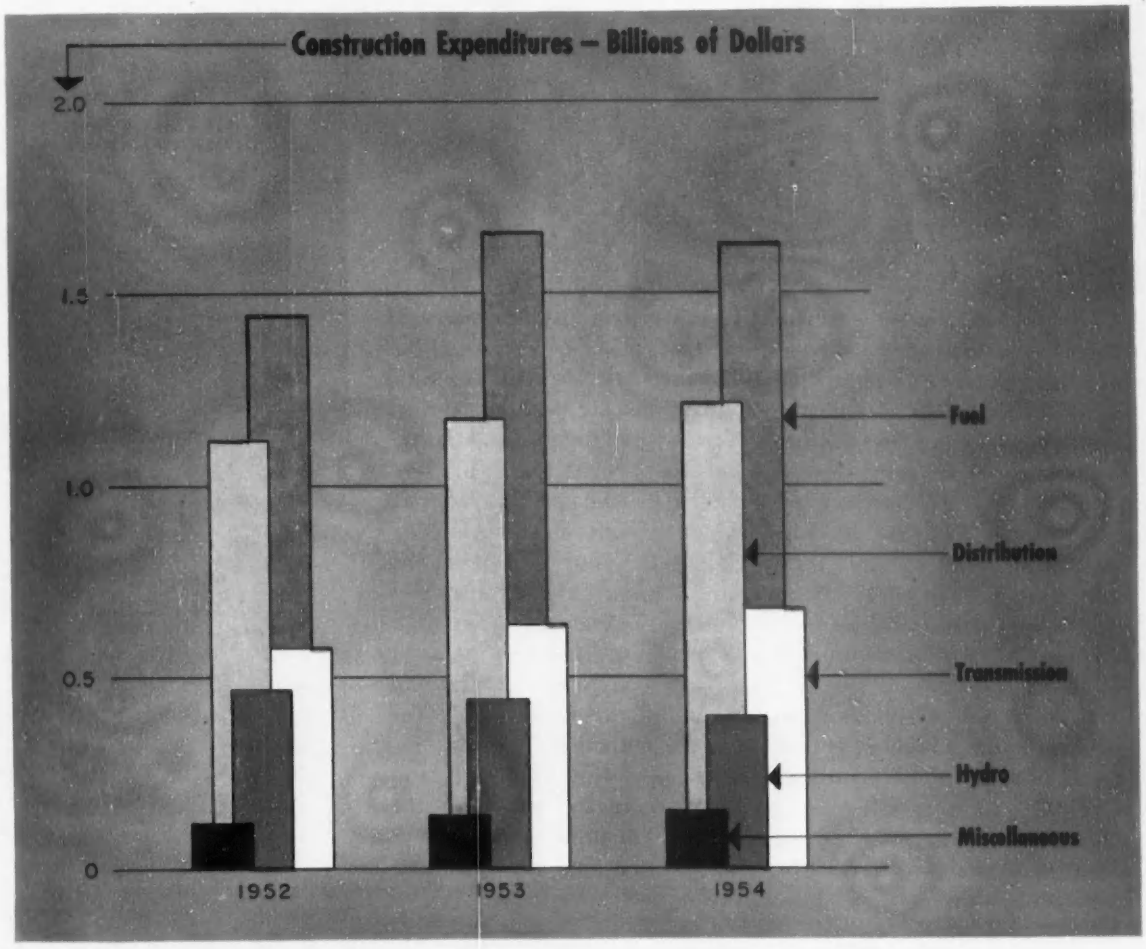
Symbolizing...

Electrical World's 50th Statistical Issue

The Statistics Summarized

	1947	1948	1949	1950	1951	1952	1953[a]
TOTAL ELECTRIC UTILITY INDUSTRY							
CUSTOMERS (1,000)							
Total	38,432	40,722	42,851	44,986	46,823	48,459	49,915
Rural[b]	1,522	1,695	1,804	1,596	1,659	1,663	1,625
Residential	31,622	33,549	35,375	37,533	39,225	40,748	41,977
Small Light and Power	4,961	5,132	5,291	5,466	5,528	5,634	5,873
Large Light and Power	191	204	232	235	248	256	279
Other	136	142	148	158	163	158	161
ENERGY SALES (1,000,000 kw hr)							
Total	217,581	240,740	248,542	280,539	318,168	342,524	389,500
Rural[b]	5,551	6,327	7,384	7,400	8,479	8,536	9,550
Residential	44,171	50,978	58,139	67,030	77,024	86,780	96,800
Small Light and Power	38,379	43,193	46,262	50,446	57,278	62,080	68,200
Large Light and Power	113,523	124,088	120,766	139,065	157,827	167,358	189,600
Other	15,957	16,154	15,991	16,599	17,560	17,770	18,350
PRODUCTION (1,000,000 kwhr)							
Total	255,739	282,698	291,099	329,141	370,673	399,224	448,014
Fuel	177,314	200,228	201,351	233,203	270,922	294,121	336,959
Hydro	78,425	82,470	89,748	95,938	99,751	105,102	105,055
REVENUE ($1,000,000)							
Total	3,853	4,313	4,614	5,086	5,648	6,137	6,779
Rural[b]	124	141	161	158	175	184	203
Residential	1,366	1,533	1,716	1,932	2,165	2,401	2,657
Small Light and Power	1,031	1,153	1,229	1,334	1,462	1,584	1,739
Large Light and Power	1,107	1,251	1,263	1,405	1,572	1,684	1,879
Other	225	237	245	258	273	284	301
CAPACITY (1,000 kw)							
Total	52,322	56,560	63,100	68,919	75,775	82,226	90,900
Fuel	37,351	40,908	46,446	51,244	56,907	61,807	69,095
Hydro	14,971	15,652	16,654	17,675	18,868	20,419	21,805
FUEL CONSUMPTION[c]							
Coal (1,000 tons)	89,530	99,950	83,960	91,870	105,768	107,070	115,560
Oil (1,000 bbl)	45,308	42,644	66,306	75,420	63,945	67,220	84,150
Gas (billion cu ft)	373	478	550	628	764	910	1,009
Pounds of coal per kwhr	1.31	1.30	1.24	1.19	1.14	1.10	1.07
EXPENDITURES ($1,000,000)							
Construction	1,569	2,418	2,954	3,118	3,151	3,740	4,064
POWER COMPANIES							
INCOME and OUTGO ($1,000,000)							
Operating revenue	3,480	3,886	4,113	4,510	5,005	5,426	5,940
Operating expenses	1,701	2,019	2,030	2,158	2,400	2,577	2,813
Taxes	664	712	794	948	1,150	1,224	1,338
Net income	656	666	765	831	823	956	1,045
Dividends	500	499	655	626	658	732	788
Balance to Surplus	156	167	110	205	165	224	257
FINANCIAL							
Electric Plant[d] ($1,000,000)	13,611	15,215	17,164	18,806	20,622	22,967	25,700
Securities issued ($1,000,000)	1,577	1,451	1,793	1,708	1,442	1,706	1,957
New capital	567	1,315	1,445	1,300	1,432	1,694	1,939
Refunding	1,010	136	348	408	10	12	18
EMPLOYEES	213,000	227,400	236,400	238,900	240,400	243,500	246,700

[a] Estimated, generally on ten months' operation. [b] On specific rural rates only. [c] For 1953 data is final and is for 12 months ended November 1. [d] Class A and B companies only.



Construction Tops 4 Billion Again in '54

The nation's electric utilities have budgeted $4.1 billion dollars for new construction in 1954. That's just a fraction over the total they spent last year. But in the face of a generally cautious business outlook, that's still a healthy advance.

The figures are the result of Electrical World's nation-wide survey which this year brought reports from utilities representing 92% of the total capacity and 84% of the total customers served in the country. All federal agencies were included, and, on the basis of capacity, 96% of the power companies, 60% of the cooperatives, and 53% of municipal, state and power district systems were heard from.

Almost half of the budget will be spent on new capacity, of which $1.6 billion will be spent in fuel generation and $397 million in hydro—both slightly under their 1953 counterparts. On the other hand, transmission and distribution expenditures will be up slightly over last year, and will total $1.9 billion dollars.

Power companies alone will account for over 70% of the total construction budget, again about the same share they had last year. They will spend $1.2 out of the $1.6 billion dollars in fuel capacity additions—more than ¾ the total, and for transmission and

Construction—Thousands of Dollars and Per Cent Total U. S.

Source: "Electrical World" Surveys. All bars from left to right: 1953, 1954

distribution their share is in the same neighborhood—73% of transmission and 79% of distribution total expenditures. Interesting to note is that expenditures for fuel additions are a little lower this year, while hydro shows an increase of $5.7 million —a 7.6% increase over last year.

The federal government still shares the lion's portion of hydro construction. It will be spending $274 million dollars in 1954, 69% of the $397 millions allotted in that part of the budget. That's $71 million less than it spent last year, and decreases its share of the total hydro by 9%. The affect is that the overall federal total shows a decrease of $34 million—roughly 5% under last year.

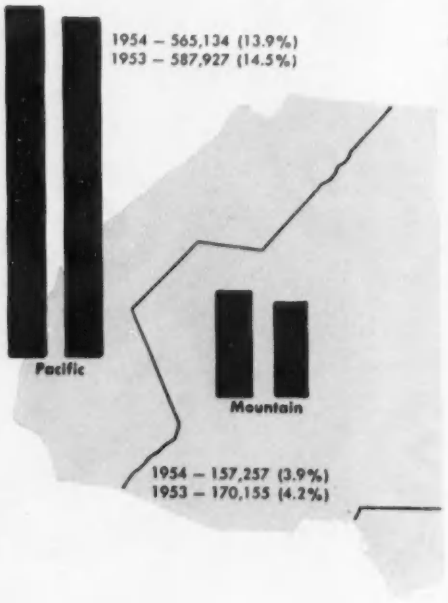
Cooperatives will also be spending less this year: $134 million as opposed to $172 million in 1953.

Municipal, state and power district systems show increases in every item of the budget. Last year's total of $147 million in generation will be upped this year by $39 million, and accounts for about 70% of the overall budget increase to bring 1954's total to $368 million.

Taking a different view, a look at the budget as it's spread out on the map points up other facts. Just three regions show increased spending plans—big enough to increase their share in the total budget. All are in the northeast: New England, Middle Atlantic, and East North Central. One other region, East South Central, shows a slight increase, and together, the four sections representing about 55% of the 1954 budget, are enough to outweigh decreases in other regions.

The West North Central and Mountain regions show the sharpest reductions in budget expenditures. Cuts of 10½% and 7.6% are in the offing for the new year in these parts.

Three regions are planning to increase expenditures in generation. Again, East North Central is one, with plans to top the 1953 budget for fuel and hydro by about $48 million dollars—that's over a 10% increase, all of it in fuel. Other region planning to spend more are East and West South Central. Significantly, there's to be a drop by about half in West South Central's hydro expenditures while 17 million more will be spent for fuel.

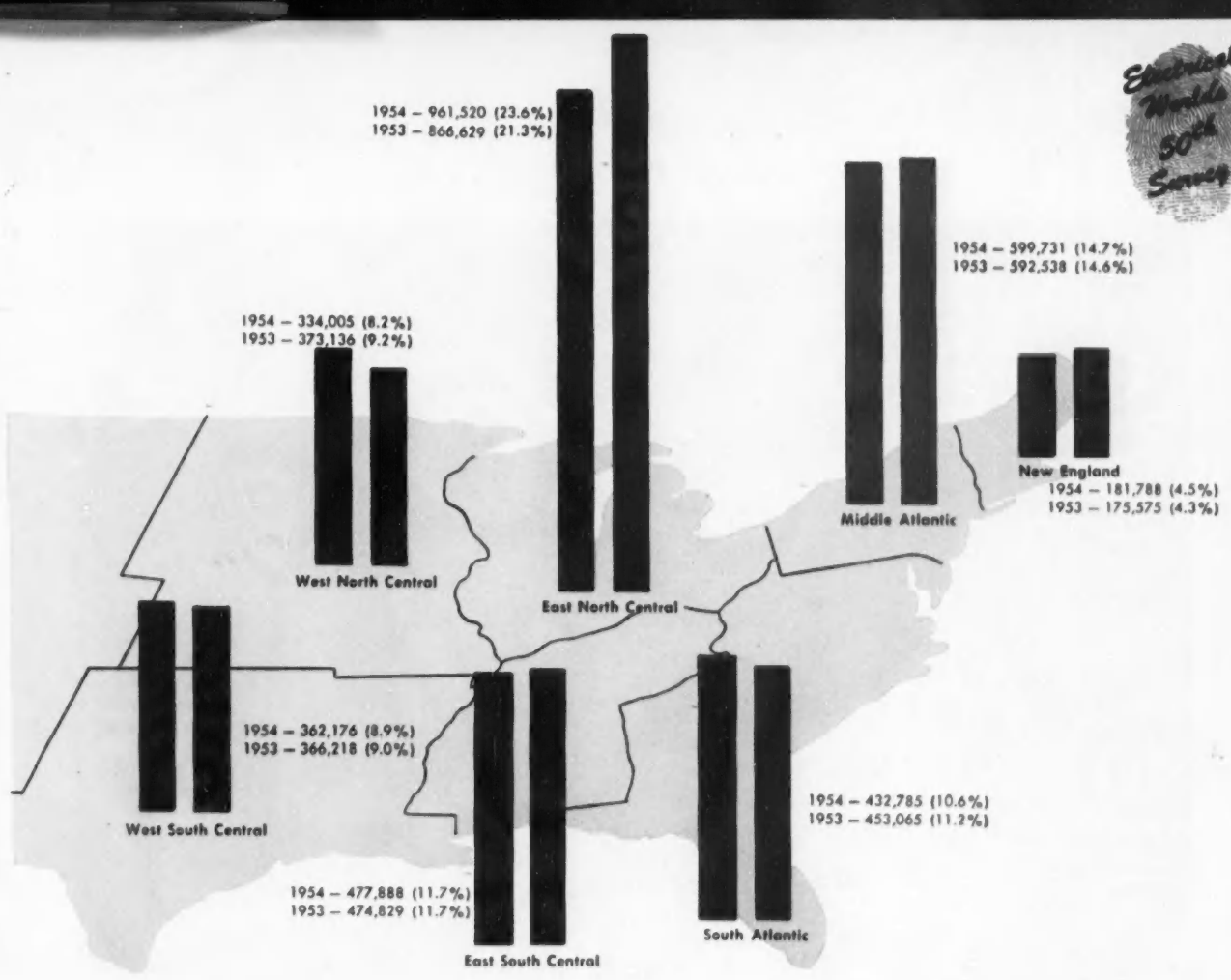


On the other hand, though Middle Atlantic will spend $39 million less in generation, the amount invested in hydro will be over 4 times what it was last year, and will bring the total up to $36 million. Upper New York State Hydro projects are the reason.

Transmission and distribution expenditures alter the pattern but slightly. The 3 northeast regions again register gains in both categories while others will be upping one or decreasing the other.

Coverage of Electrical World's 1953-1954 Survey

	Percentage of Group Reporting on the basis of Capacity	Customers	Group's share of U. S. Total Capacity	Customers
Power Companies	96%	95%	77.7%	79.4%
Municipal, State and Power District Systems	53%	48%	9.3%	12.6%
Cooperatives	60%	31%	0.6%	8.0%
Federal Agencies	100%	.....	12.4%	.....
All Groups	92%	84%	100.0%	100.0%



Power Company, Municipal, State & Power District Systems Construction—Thousands of $

	Fuel	Hydro	Transmission	Distribution	Miscellaneous	Total
1937	113,060	10,540	65,385	227,895	38,600	455,480
1938	133,000	17,600	59,200	238,200	34,000	482,000
1939	101,500	17,900	61,375	226,375	22,850	430,000
1940	200,430	9,270	84,780	266,580	35,520	596,580
1941	219,741	27,186	101,085	272,449	32,687	653,148
1942†	191,671	22,847	85,633	144,180	11,644	455,975
1943	137,059	35,505	42,923	84,683	6,066	306,236
1944	96,126	19,888	61,196	151,969	11,105	340,284
1945	106,166	12,713	68,935	204,492	16,623	408,929
1946	190,955	18,974	106,550	360,980	40,710	718,169
1947	440,547	40,901	195,074	624,038	71,585	1,372,145
1948	813,025	86,188	280,530	822,275	76,070	2,078,088
1949	1,078,081	150,653	288,358	916,475	84,047	2,517,614
1950	960,739	107,730	300,093	879,242	99,367	2,347,171
1951	940,547	125,463	346,059	910,581	120,674	2,443,324
1952	1,260,418	128,711	417,427	988,861	105,833	2,901,250
1953	1,441,281	96,113	471,303	1,059,304	119,488	3,187,489
1954‡	1,363,333	122,858	551,056	1,099,860	134,401	3,271,508

Source: "Electrical World" Surveys, privately owned utilities only. † Expenditure study not made by Electrical World in 1942. Figures are those reported by Federal Power Commission for ‡ Prospective.

Electrical World's 50th Survey

1953 Expenditures—Thousands of Dollars

	Fuel	Hydro	Transmission	Distribution	Miscellaneous	Total
New England						
Power Companies	60,850	9,570	13,720	63,660	7,750	155,550
Municipal, State and Power District Systems	10,211	.....	346	1,443	110	12,110
Cooperatives	*	.....	*	7,915	.....	7,915
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**71,061**	**9,570**	**14,066**	**73,018**	**7,860**	**175,575**
Middle Atlantic						
Power Companies	281,850	9,180	62,750	198,675	24,680	577,135
Municipal, State and Power District Systems	1,546	.....	.....	1,572	.....	3,118
Cooperatives	*	.....	*	12,285	.....	12,285
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**283,396**	**9,180**	**62,750**	**212,532**	**24,680**	**592,538**
East North Central						
Power Companies	424,000	1,875	139,700	208,380	27,620	801,575
Municipal, State and Power District Systems	25,468	2	1,309	17,843	1,058	45,680
Cooperatives	1,335†	.....	8,687	8,968	.....	18,990
Federal Agencies	.....	384	.....	.....	.....	384
Total	**450,803**	**2,261**	**149,696**	**235,191**	**28,678**	**866,629**
West North Central						
Power Companies	81,500	2,370	38,250	61,340	10,290	193,750
Municipal, State and Power District Systems	25,182	659	3,704	14,584	1,338	45,467
Cooperatives	3,374†	.....	7,830	30,922	.....	42,126
Federal Agencies	.....	88,793	3,000	.....	.....	91,793
Total	**110,056**	**91,822**	**52,784**	**106,846**	**11,628**	**373,136**
South Atlantic						
Power Companies	170,400	7,500	62,075	132,830	11,470	384,275
Municipal, State and Power District Systems	6,253	.....	1,731	3,986	362	12,332
Cooperatives	*	.....	1,570	20,171	.....	21,741
Federal Agencies	.....	28,217	6,500	.....	.....	34,717
Total	**176,653**	**35,717**	**71,876**	**156,987**	**11,832**	**453,065**
East South Central						
Power Companies	56,950	275	20,760	26,350	3,240	107,575
Municipal, State and Power District Systems	6,431	.....	10,191	25,705	2,158	44,485
Cooperatives	*	.....	1,895	21,403	.....	23,298
Federal Agencies	198,000	45,121	48,350	.....	8,000	299,471
Total	**261,381**	**45,396**	**81,196**	**73,458**	**13,398**	**474,829**
West South Central						
Power Companies	125,750	.....	49,500	98,800	8,570	282,620
Municipal, State and Power District Systems	19,101	5	1,747	12,839	594	34,286
Cooperatives	*	.....	1,824	17,199	.....	19,023
Federal Agencies	.....	22,639	7,650	.....	.....	30,289
Total	**144,851**	**22,644**	**60,721**	**128,833**	**9,164**	**366,218**
Mountain						
Power Companies	27,350	3,360	10,450	31,740	2,870	75,770
Municipal, State and Power District Systems	13,552	.....	3,277	3,696	428	20,953
Cooperatives	*	.....	861	14,915	.....	15,776
Federal Agencies	.....	28,537	28,832	287	.....	57,656
Total	**40,902**	**31,897**	**43,420**	**50,638**	**3,298**	**170,155**
Pacific						
Power Companies	86,885	40,660	44,670	116,350	8,890	297,455
Municipal, State and Power District Systems	18,002	20,657	7,123	39,511	8,060	93,353
Cooperatives	*	.....	492	7,135	.....	7,627
Federal Agencies	.....	131,172	58,320	.....	.....	189,492
Total	**104,887**	**192,489**	**110,605**	**162,996**	**16,950**	**587,927**
Total United States						
Power Companies	1,315,535	74,790	441,875	938,125	105,380	2,875,705
Municipal, State and Power District Systems	125,746	21,323	29,428	121,179	14,108	311,784
Cooperatives	8,188†*	.....	23,181*	140,913	.....	172,282*
Federal Agencies	198,000	344,863	152,652	287	8,000	703,802
Total	**1,647,469**	**440,976**	**647,136**	**1,200,504**	**127,488**	**4,063,573**

Source: "Electrical World" Surveys. * Withheld because the regional estimate did not meet publication standards. U.S. total is greater than sum of regional estimates.
† Includes hydro.

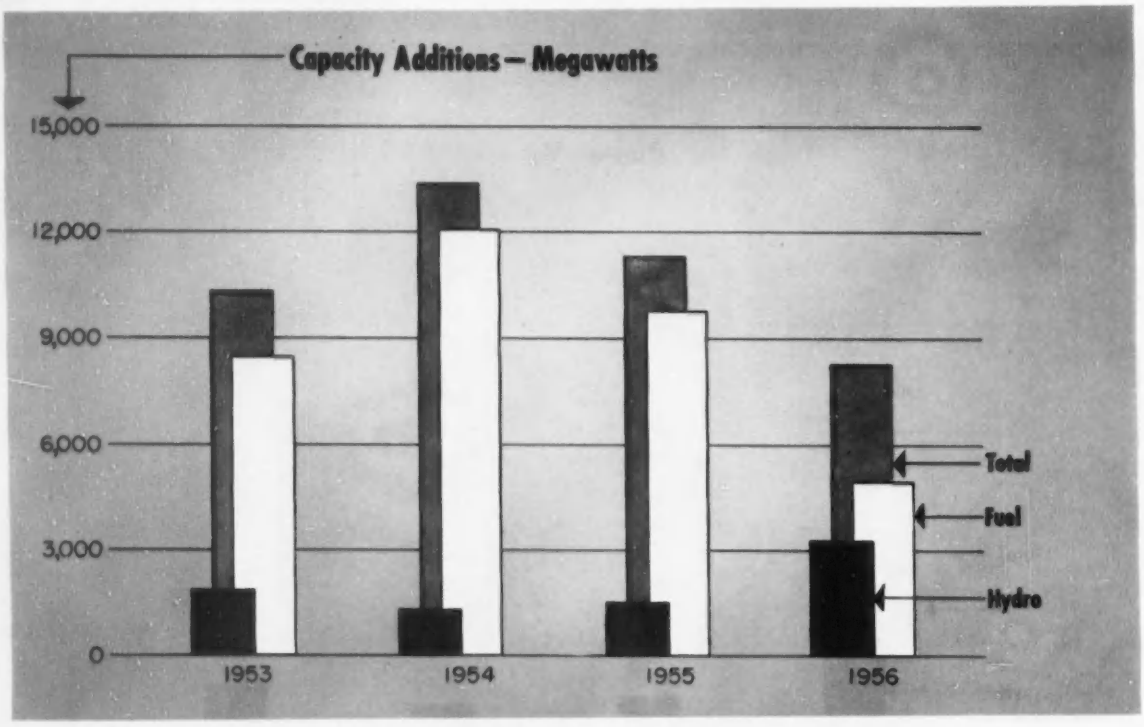
1954 Expenditures—Thousands of Dollars

	Fuel	Hydro	Transmission	Distribution	Miscellaneous	Total
New England						
Power Companies	40,140	18,025	23,115	72,350	9,715	163,345
Municipal, State and Power District Systems	6,756	.....	396	1,604	93	8,849
Cooperatives	*	.....	77	9,517	.....	9,594
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**46,896**	**18,025**	**23,588**	**83,471**	**9,808**	**181,788**
Middle Atlantic						
Power Companies	210,950	6,440	83,520	218,500	30,650	550,060
Municipal, State and Power District Systems	5,732	30,000	.....	1,998	501	38,231
Cooperatives	*	.....	*	11,440	.....	11,440
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**216,682**	**36,440**	**83,520**	**231,938**	**31,151**	**599,731**
East North Central						
Power Companies	457,775	1,750	181,890	220,180	28,730	890,325
Municipal, State and Power District Systems	40,399	.....	2,181	15,299	601	58,480
Cooperatives	732†	.....	3,085	8,898	.....	12,715
Federal Agencies	.....	.....	.....	.....	.....	.....
Total	**498,906**	**1,750**	**187,156**	**244,377**	**29,331**	**961,520**
West North Central						
Power Companies	63,820	2,675	43,200	59,800	11,270	180,765
Municipal, State and Power District Systems	20,671	1,711	4,844	14,533	1,380	43,139
Cooperatives	1,851†	.....	4,941	23,451	.....	30,243
Federal Agencies	.....	75,658	4,200	.....	.....	79,858
Total	**86,342**	**80,044**	**57,185**	**97,784**	**12,650**	**334,005**
South Atlantic						
Power Companies	151,460	9,290	64,675	134,300	10,985	370,710
Municipal, State and Power District Systems	19,040	.....	2,368	4,585	277	26,270
Cooperatives	*	.....	959	16,211	.....	17,170
Federal Agencies	.....	16,335	2,300	.....	.....	18,635
Total	**170,500**	**25,625**	**70,302**	**155,096**	**11,262**	**432,785**
East South Central						
Power Companies	29,200	890	16,340	27,100	2,730	76,260
Municipal, State and Power District Systems	1,601	.....	12,464	22,588	2,768	39,421
Cooperatives	*	.....	*	18,025	.....	18,025
Federal Agencies	246,000	30,182	61,000	.....	7,000	344,182
Total	**276,801**	**31,072**	**89,804**	**67,713**	**12,498**	**477,888**
West South Central						
Power Companies	147,180	.....	44,440	94,460	12,185	298,265
Municipal, State and Power District Systems	15,154	4	4,082	15,629	614	35,483
Cooperatives	*	.....	1,164	14,240	.....	15,404
Federal Agencies	.....	11,524	1,500	.....	.....	13,024
Total	**162,334**	**11,528**	**51,186**	**124,329**	**12,799**	**362,176**
Mountain						
Power Companies	38,025	6,735	16,535	32,750	4,435	98,480
Municipal, State and Power District Systems	3,202	.....	.....	2,096	737	6,035
Cooperatives	*	.....	425	7,097	.....	7,522
Federal Agencies	.....	21,786	23,047	387	.....	45,220
Total	**41,227**	**28,521**	**40,007**	**42,330**	**5,172**	**157,257**
Pacific						
Power Companies	81,135	34,700	42,695	107,970	9,185	275,685
Municipal, State and Power District Systems	31,093	10,638	8,311	54,118	7,545	111,705
Cooperatives	*	.....	400	8,394	.....	8,794
Federal Agencies	.....	118,600	50,350	.....	.....	168,950
Total	**112,228**	**163,938**	**101,756**	**170,482**	**16,730**	**565,134**
Total United States						
Power Companies	1,219,685	80,505	516,410	967,410	119,885	2,903,895
Municipal, State and Power District Systems	143,648	42,353	34,646	132,450	14,516	367,613
Cooperatives	4,493†*	.....	11,872*	117,273	.....	133,638*
Federal Agencies	246,000	274,085	142,397	387	7,000	669,869
Total	**1,613,826**	**396,943**	**705,325**	**1,217,520**	**141,401**	**4,075,015**

Source: "Electrical World" Surveys. * Withheld because the regional estimate did not meet publication standards. U.S. total is greater than sum of regional estimates.
† Includes hydro.

Electrical World's 50th Survey

NEW CAPACITY

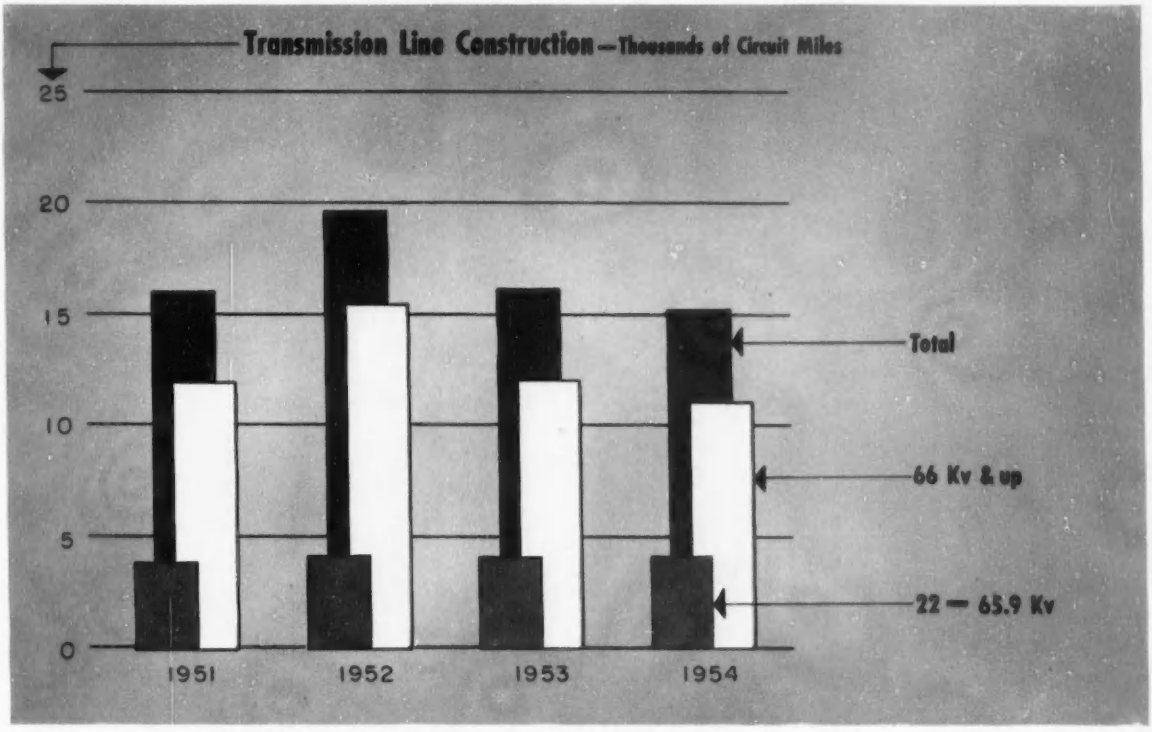


Industry's Plans Call for 50,000 Mw

Capacity Additions Reported to Electrical World—Kw † . . . . For details see pages 192-198

	1953	1954	1955	1956	After 1956
Hydro					
Power Companies	462,762	237,818	334,500	325,400	819,000
Municipal, State and Power District Systems	247,100	.....	.....	2,273,500	715,000
Cooperatives	.....	600	.....	.....	.....
Federal Agencies	1,151,667	1,025,484	1,141,200	702,000	10,488,210
Total	1,861,529	1,263,902	1,475,700	3,300,900	12,022,210
Steam					
Power Companies	7,321,900	8,926,100	7,754,100	4,061,600	4,550,500
Municipal, State and Power District Systems	340,975	702,375	287,500	347,500	310,000
Cooperatives	81,500	.....	50,000	44,250	66,000
Federal Agencies	847,000	2,450,000	1,750,000	450,000	.....
Total	8,591,375	12,078,475	9,841,600	4,903,350	4,926,500
Internal Combustion					
Power Companies	29,015	19,000	9,800	7,500	6,000
Municipal, State and Power District Systems	5,953	11,690	18,177	12,750	12,260
Cooperatives	2,345	12,235	1,000	4,400	1,000
Federal Agencies	.....	.....	.....	.....	.....
Total	37,313	42,925	28,977	24,650	19,260
Total					
Power Companies	7,813,677	9,182,918	8,098,400	4,394,500	5,375,500
Municipal, State and Power District Systems	594,028	714,065	305,677	2,633,750	1,037,260
Cooperatives	83,845	12,835	51,000	48,650	67,000
Federal Agencies	1,998,667	3,475,484	2,891,200	1,152,000	10,488,210
Total	10,490,217	13,385,302	11,346,277	8,228,900	16,967,970

Source: "Electrical World" Surveys. † Maximum rated capability.



T & D Line Construction Tapering Off

Transmission and primary distribution line construction is tapering off. In 1952 almost 20,000 circuit miles of transmission were added. Construction during 1953 added 16,245 circuit miles. Budgets for 1954 call for an additional 15,308 circuit miles. Construction of lower-voltage lines, 22 to 65.9 kv, will, however, be at the same level as 1952 and 1953.

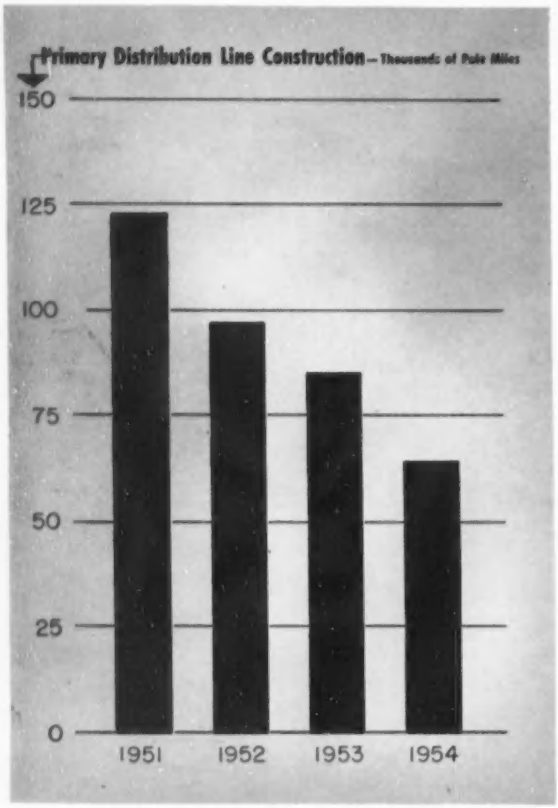
Primary distribution line additions totalled 84,756 pole miles during 1953. This was almost 12,000 miles fewer than the 1952 record construction. Estimates for 1954 indicate another cut of nearly 20,000 pole miles reducing 1954 construction to 64,097.

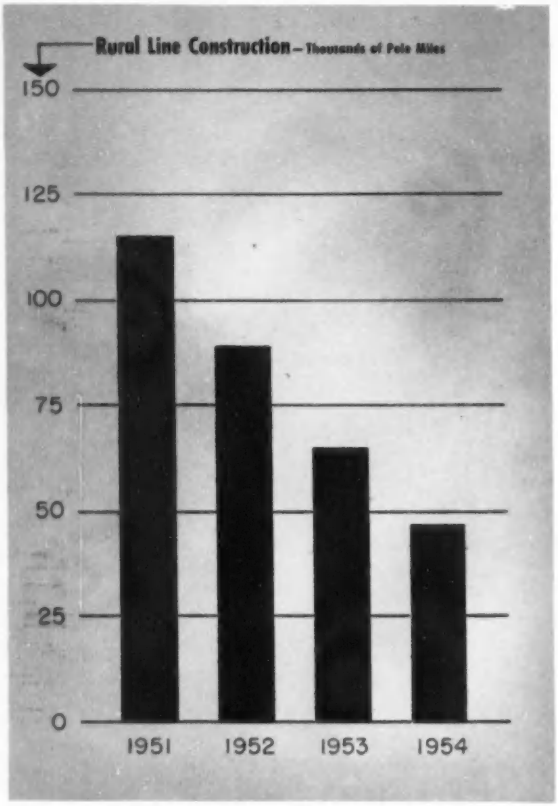
On the other hand, substation capacity will be on the increase. Total additions of 35 million kva are planned for 1954, as against the 28 million kva added during 1953, and the 25½ million kva in 1952. Utilities will spend $433 million in 1954 substation additions, $21.6 million or 5% more than last year.

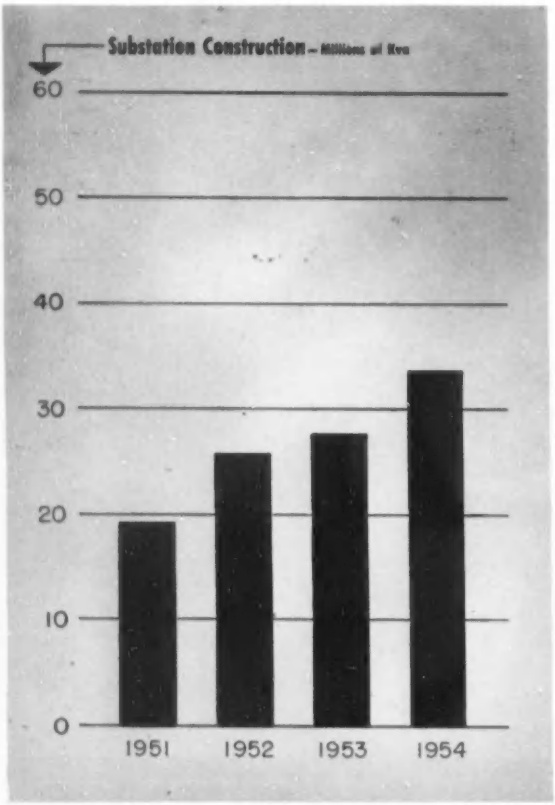
Transmission & Distribution Construction

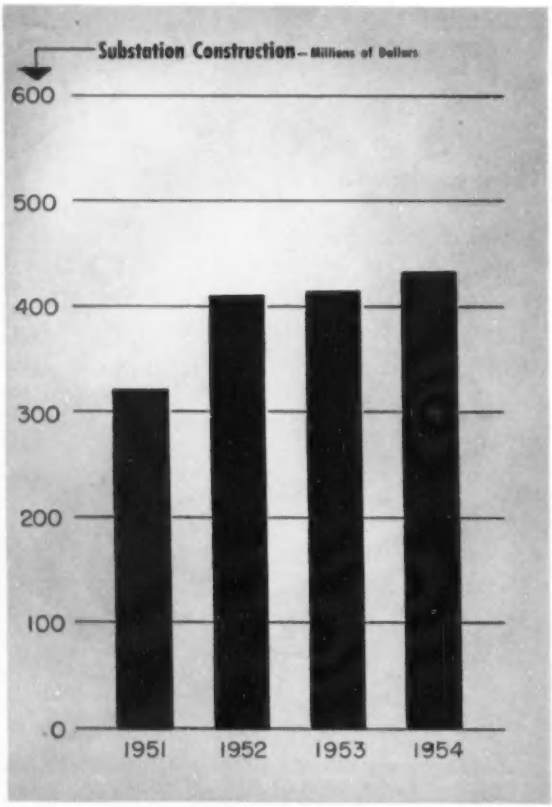
	1951	1952	1953	1954
Transmission Line Construction—Circuit Miles	16,036	19,673	16,245	15,308
66 kv & up	12,027	15,475	12,076	11,141
22–65.9 kv	4,009	4,198	4,169	4,167
Primary Distribution Line Construction—Pole Miles	123,017	97,143	84,756	64,097
Rural Primary Distribution Line Construction—Pole Miles	114,642	88,560	64,557	46,812
Substation Construction—Thousands of Kva	19,310	25,556	28,154	35,444
Substation Construction—Thousands of Dollars	320,728	410,390	412,593	433,016

Source: "Electrical World" Surveys.


Primary Distribution Line Construction — Thousands of Pole Miles
150
125
100
75
50
25
0
1951
1952
1953
1954


Rural Line Construction — Thousands of Pole Miles
150
125
100
75
50
25
0
1951
1952
1953
1954


Substation Construction — Millions of Kva
60
50
40
30
20
10
0
1951
1952
1953
1954


Substation Construction — Millions of Dollars
600
500
400
300
200
100
0
1951
1952
1953
1954

Transmission & Distribution Expenditures—Thousands of Dollars

	1953				1954			
	Transmission Line	Primary Distribution Line Total	Rural	Substations	Transmission Line	Primary Distribution Line Total	Rural	Substations
New England								
Power Companies	9,720	34,375	765	9,550	11,450	31,800	510	17,100
Municipal, State and Power District Systems	152	588	84	149	72	1,043	81	446
Cooperatives	*	7,684	7,684	34	70	9,240	9,240	35
Federal Agencies	.....	.....	.....	.....	.....	.....	.....	.....
Total	**9,872**	**42,647**	**8,533**	**9,733**	**11,592**	**42,083**	**9,831**	**17,581**
Middle Atlantic								
Power Companies	26,000	108,200	5,000	53,650	37,175	112,600	3,662	63,975
Municipal, State and Power District Systems	.....	472	.....	70	.....	712	.....	.....
Cooperatives	*	11,927	11,927	101	*	10,966	10,966	106
Federal Agencies	.....	.....	.....	.....	.....	.....	.....	.....
Total	**26,000**	**120,599**	**16,927**	**53,821**	**37,175**	**124,278**	**14,628**	**64,081**
East North Central								
Power Companies	73,400	120,800	13,550	79,800	91,390	119,550	13,210	95,675
Municipal, State and Power District Systems	574	7,600	144	746	1,301	7,240	144	2,205
Cooperatives	6,682	7,190	7,190	1,433	2,374	7,272	7,272	1,284
Federal Agencies	.....	.....	.....	.....	.....	.....	.....	.....
Total	**80,656**	**135,590**	**20,884**	**81,979**	**95,065**	**134,062**	**20,626**	**99,164**
West North Central								
Power Companies	20,000	37,600	3,980	21,300	23,000	37,250	4,660	19,900
Municipal, State and Power District Systems	1,313	2,951	916	2,342	1,417	10,959	763	1,935
Cooperatives	6,023	28,369	28,369	2,436	3,801	19,941	19,941	1,574
Federal Agencies	.....	.....	.....	3,000	.....	.....	.....	4,200
Total	**27,336**	**68,920**	**33,265**	**29,078**	**28,218**	**68,150**	**25,364**	**27,609**
South Atlantic								
Power Companies	25,920	77,575	13,615	31,550	31,110	76,550	13,560	32,530
Municipal, State and Power District Systems	1,651	3,250	636	795	2,314	3,606	658	1,298
Cooperatives	1,427	13,165	13,165	2,924	872	11,329	11,329	2,180
Federal Agencies	.....	.....	.....	6,500	.....	.....	.....	2,300
Total	**28,998**	**93,990**	**27,416**	**41,769**	**34,296**	**91,485**	**25,547**	**38,308**
East South Central								
Power Companies	10,600	9,070	2,850	12,530	7,375	9,700	2,430	12,250
Municipal, State and Power District Systems	2,582	9,061	1,955	6,446	5,342	8,460	1,686	8,077
Cooperatives	1,579	15,288	15,288	1,951	*	11,293	11,293	1,582
Federal Agencies	14,000	.....	.....	35,050	19,000	.....	.....	42,300
Total	**28,761**	**33,419**	**20,093**	**55,977**	**31,717**	**29,453**	**15,409**	**64,209**
West South Central								
Power Companies	27,720	39,800	8,700	29,050	21,150	35,425	6,990	32,900
Municipal, State and Power District Systems	1,502	9,285	455	2,269	4,044	10,635	161	3,269
Cooperatives	1,520	13,702	13,702	3,160	970	11,459	11,459	2,502
Federal Agencies	1,893	.....	.....	5,757	.....	.....	.....	1,500
Total	**32,635**	**62,787**	**22,857**	**40,236**	**26,164**	**57,519**	**18,610**	**40,171**
Mountain								
Power Companies	7,625	19,830	3,400	8,840	11,150	20,370	3,450	11,150
Municipal, State and Power District Systems	3,192	314	49	3,804	.....	628	59	.....
Cooperatives	783	11,473	11,473	2,686	386	4,551	4,551	908
Federal Agencies	16,283	287	.....	11,628	11,349	387	.....	10,739
Total	**27,883**	**31,904**	**14,922**	**26,958**	**22,885**	**25,936**	**8,060**	**22,797**
Pacific								
Power Companies	21,440	54,100	10,820	27,500	21,775	42,430	10,360	24,080
Municipal, State and Power District Systems	1,260	3,315	1,193	17,345	4,569	10,933	1,153	22,115
Cooperatives	447	6,234	6,234	627	363	7,366	7,366	705
Federal Agencies	30,000	.....	.....	27,570	8,279	.....	.....	12,196
Total	**53,147**	**63,649**	**18,247**	**73,042**	**34,986**	**60,729**	**18,879**	**59,096**
Total United States								
Power Companies	222,425	501,350	62,680	273,770	255,575	485,675	58,832	309,560
Municipal, State and Power District Systems	12,226	36,836	5,432	33,966	19,059	54,216	4,705	39,345
Cooperatives	18,461*	115,032	115,032	15,352	8,836	93,417	93,417	10,876
Federal Agencies	62,176	287	.....	89,505	38,628	387	.....	73,235
Total	**315,288**	**653,505**	**183,144**	**412,593**	**322,098**	**633,695**	**156,954**	**433,016**

Source: "Electrical World" Surveys. * Withheld because the regional estimate did not meet publication standards. U.S. total is greater than sum of regional estimates.

1953 Transmission & Distribution Construction

	Transmission-Circuit Miles		Primary Distribution-Pole Miles		Underground Cable Miles†		Substations-Kva
	66 kv & up	22-65.9 kv	Total	Rural	Transmission	Distribution	
New England							
Power Companies	190	175	725	180	20	45	800,000
Municipal, State and Power District Systems	.....	25	723	12	1	3	90,000
Cooperatives	*	.....	226	226	.....	.....	1,320
Federal Agencies	.....	.....	.....	.....	.....	.....	.....
Total	190	200	1,674	418	21	48	891,320
Middle Atlantic							
Power Companies	575	275	2,990	1,130	155	960	3,590,000
Municipal, State and Power District Systems	.....	.....	247	.....	.....	.....	25,000
Cooperatives	*	.....	345	345	.....	.....	3,959
Federal Agencies	.....	.....	.....	.....	.....	.....	.....
Total	575	275	3,582	1,475	155	960	3,618,959
East North Central							
Power Companies	1,975	875	4,025	1,750	125	415	5,350,000
Municipal, State and Power District Systems	.....	2	1,521	50	14	28	250,000
Cooperatives	.....	399	2,937	2,937	.....	.....	76,656
Federal Agencies	.....	.....	.....	.....	.....	.....	.....
Total	1,975	1,276	8,483	4,737	139	443	5,676,656
West North Central							
Power Companies	975	300	1,875	875	.....	50	1,700,000
Municipal, State and Power District Systems	69	136	1,688	433	6	59	245,000
Cooperatives	853	157	13,195	13,195	.....	.....	187,369
Federal Agencies	.....	.....	.....	.....	.....	.....	.....
Total	1,897	593	16,758	14,503	6	109	2,132,369
South Atlantic							
Power Companies	1,450	300	5,675	3,590	15	105	2,550,000
Municipal, State and Power District Systems	13	96	1,506	385	.....	28	180,000
Cooperatives	4	180	6,466	6,466	.....	.....	129,966
Federal Agencies	.....	.....	.....	.....	.....	.....	430,000
Total	1,467	576	13,647	10,441	15	133	3,289,966
East South Central							
Power Companies	465	110	1,850	1,250	9	5	960,000
Municipal, State and Power District Systems	113	52	1,408	552	.....	20	630,000
Cooperatives	129	82	6,177	6,177	.....	.....	83,390
Federal Agencies	680	70	.....	.....	.....	.....	1,597,000
Total	1,387	314	9,435	7,979	9	25	3,270,390
West South Central							
Power Companies	1,375	200	4,850	2,650	.....	40	2,875,000
Municipal, State and Power District Systems	21	12	799	195	.....	1	340,000
Cooperatives	260	76	7,971	7,971	.....	.....	196,884
Federal Agencies	30	.....	.....	.....	.....	.....	325,000
Total	1,686	288	13,620	10,816	.....	41	3,736,884
Mountain							
Power Companies	410	235	1,430	785	.....	5	460,000
Municipal, State and Power District Systems	150	200	166	25	.....	.....	285,000
Cooperatives	239	.....	9,513	9,513	.....	.....	103,692
Federal Agencies	509	.....	22	.....	.....	.....	248,000
Total	1,308	435	11,131	10,323	.....	5	1,096,692
Pacific							
Power Companies	970	70	3,700	2,100	.....	55	2,350,000
Municipal, State and Power District Systems	128	90	1,246	285	30	57	1,000,000
Cooperatives	18	52	1,480	1,480	.....	.....	48,248
Federal Agencies	472	.....	.....	.....	.....	.....	1,043,000
Total	1,588	212	6,426	3,865	30	112	4,441,248
Total United States							
Power Companies	8,385	2,540	27,120	14,310	324	1,680	20,635,000
Municipal, State and Power District Systems	494	613	9,304	1,937	51	196	3,045,000
Cooperatives	1,506*	946	48,310	48,310	.....	.....	831,484
Federal Agencies	1,691	70	22	.....	.....	.....	3,643,000
Total	12,076	4,169	84,756	64,557	375	1,876	28,154,484

Source: "Electrical World" Surveys. * Withheld because the regional estimate did not meet publication standards. U.S. total is greater than the sum of regional estimates. † Includes submarine.

1954 Transmission & Distribution Construction

	Transmission-Circuit Miles		Primary Distribution-Pole Miles		Underground Cable Miles†		Substations-Kva
	66 kv & up	22–65.9 kv	Total	Rural	Transmission	Distribution	
New England							
Power Companies	255	180	625	125	12	85	1,425,000
Municipal, State and Power District Systems	.....	63	453	28	2	3	50,000
Cooperatives	.....	10	308	308	.....	.....	1,377
Federal Agencies	.....	.....	.....	.....	.....	.....	.....
Total	**255**	**253**	**1,386**	**461**	**14**	**88**	**1,476,377**
Middle Atlantic							
Power Companies	775	475	2,850	950	140	970	3,775,000
Municipal, State and Power District Systems	.....	.....	85	.....	.....	.....	.....
Cooperatives	*	*	360	360	.....	.....	4,131
Federal Agencies	.....	.....	.....	.....	.....	.....	.....
Total	**775**	**475**	**3,295**	**1,310**	**140**	**970**	**3,779,131**
East North Central							
Power Companies	2,350	1,025	3,900	1,575	110	640	6,550,000
Municipal, State and Power District Systems	23	14	1,026	27	8	26	260,000
Cooperatives	158	26	2,630	2,630	.....	.....	68,643
Federal Agencies	.....	.....	.....	.....	.....	.....	.....
Total	**2,531**	**1,065**	**7,556**	**4,232**	**118**	**666**	**6,878,643**
West North Central							
Power Companies	725	335	1,675	710	.....	50	1,575,000
Municipal, State and Power District Systems	16	241	688	276	.....	17	340,000
Cooperatives	418	46	8,526	8,526	.....	.....	121,069
Federal Agencies	.....	.....	.....	.....	.....	.....	200,000
Total	**1,159**	**622**	**10,889**	**9,512**	.....	**67**	**2,236,069**
South Atlantic							
Power Companies	1,200	340	5,525	3,250	30	95	4,090,000
Municipal, State and Power District Systems	20	6	751	94	3	11	415,000
Cooperatives	.....	85	4,821	4,821	.....	.....	96,902
Federal Agencies	.....	.....	.....	.....	.....	.....	155,000
Total	**1,220**	**431**	**11,097**	**8,165**	**33**	**106**	**4,756,902**
East South Central							
Power Companies	525	195	1,745	1,050	.....	2	1,300,000
Municipal, State and Power District Systems	122	94	1,148	487	.....	16	745,000
Cooperatives	*	*	5,008	5,008	.....	.....	67,608
Federal Agencies	675	135	.....	.....	.....	.....	4,470,000
Total	**1,322**	**424**	**7,901**	**6,545**	.....	**18**	**6,582,608**
West South Central							
Power Companies	1,000	160	4,100	2,095	.....	60	2,890,000
Municipal, State and Power District Systems	180	.....	690	142	.....	2	180,000
Cooperatives	133	21	6,331	6,331	.....	.....	156,376
Federal Agencies	.....	.....	.....	.....	.....	.....	95,000
Total	**1,313**	**181**	**11,121**	**8,568**	.....	**62**	**3,321,376**
Mountain							
Power Companies	570	360	1,500	825	.....	10	600,000
Municipal, State and Power District Systems	.....	.....	123	15	.....	.....	85,000
Cooperatives	45	58	3,205	3,205	.....	.....	34,935
Federal Agencies	427	.....	30	.....	.....	.....	554,000
Total	**1,042**	**418**	**4,858**	**4,045**	.....	**10**	**1,273,935**
Pacific							
Power Companies	820	85	3,675	2,050	.....	50	1,825,000
Municipal, State and Power District Systems	277	91	655	260	51	39	1,100,000
Cooperatives	5	25	1,664	1,664	.....	.....	54,246
Federal Agencies	422	.....	.....	.....	.....	.....	2,160,000
Total	**1,524**	**201**	**5,994**	**3,974**	**51**	**89**	**5,139,246**
Total United States							
Power Companies	8,220	3,155	25,595	12,630	292	1,962	24,030,000
Municipal, State and Power District Systems	638	509	5,619	1,329	64	114	3,175,000
Cooperatives	759*	368*	32,853	32,853	.....	.....	605,287
Federal Agencies	1,524	135	30	.....	.....	.....	7,634,000
Total	**11,141**	**4,167**	**64,097**	**46,812**	**356**	**2,076**	**35,444,287**

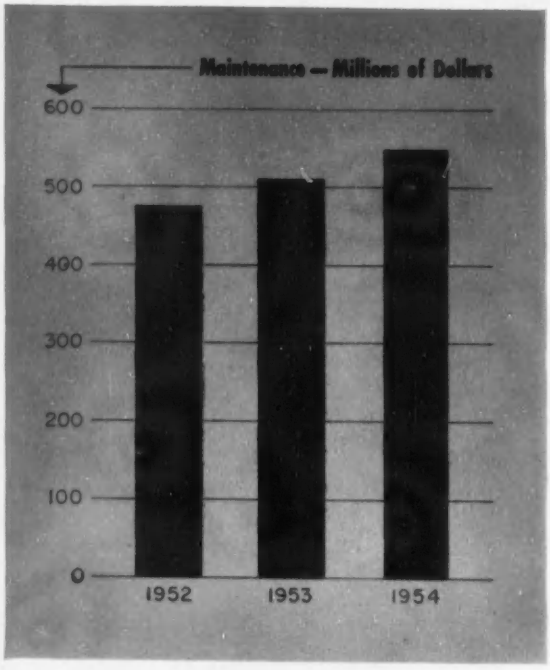
Source: "Electrical World" Surveys. * Withheld because the regional estimate did not meet publication standards. U.S. total is greater than sum of regional estimates.
† Includes submarine.

Electrical World's 50th Survey

MAINTENANCE

$546 Million For '54 Maintenance

The electric utilities will spend about $35 million more for maintenance during 1954 bringing the total to $545.9 million. Most of that will be paid by the power companies who'll contribute $432 million, or about 80% of the total upkeep—a shade less than their share last year.



Maintenance—Thousands of Dollars

	1953	1954
New England		
Power Companies	30,650	31,035
Municipal, State & Power District Systems	2,277	2,331
Cooperatives	61	67
Federal Agencies	.....	.....
Total	32,988	33,433
Middle Atlantic		
Power Companies	128,375	131,270
Municipal, State & Power District Systems	823	886
Cooperatives	230	219
Federal Agencies	.....	.....
Total	129,428	132,375
East North Central		
Power Companies	101,300	105,200
Municipal, State & Power District Systems	6,587	7,217
Cooperatives	1,836	2,033
Federal Agencies	40	40
Total	109,763	114,490
West North Central		
Power Companies	23,250	24,950
Municipal, State & Power District Systems	6,842	17,445
Cooperatives	4,820	4,559
Federal Agencies	.....	160
Total	34,912	47,114
South Atlantic		
Power Companies	51,300	54,125
Municipal, State & Power District Systems	1,892	2,759
Cooperatives	2,096	2,473
Federal Agencies	450	570
Total	55,738	59,927
East South Central		
Power Companies	11,160	11,600
Municipal, State & Power District Systems	14,237	14,180
Cooperatives	2,004	2,293
Federal Agencies	7,460	8,475
Total	34,861	36,548
West South Central		
Power Companies	27,550	29,400
Municipal, State & Power District Systems	4,184	4,254
Cooperatives	2,892	2,218
Federal Agencies	1,797	1,900
Total	36,423	37,772
Mountain		
Power Companies	9,530	10,045
Municipal, State & Power District Systems	9,272	9,673
Cooperatives	1,086	1,268
Federal Agencies	11,457	13,096
Total	31,345	34,082
Pacific		
Power Companies	31,825	34,460
Municipal, State & Power District Systems	12,914	14,188
Cooperatives	291	310
Federal Agencies	760	1,160
Total	45,790	50,118
Total United States		
Power Companies	414,940	432,085
Municipal, State & Power District Systems	59,028	72,933
Cooperatives	15,316	15,440
Federal Agencies	21,964	25,401
Total	511,248	545,859

Source: "Electrical World" Surveys.

Electrical World's 50th Survey

HAWAII, ALASKA & PUERTO RICO

Budget Accents New Capacity

Territorial construction will nearly triple last year's. Plans call for $61 million to be spent—more than ¾ of that for new capacity. Puerto Rico Water Resources Authority's future additions total 108 Mw. Alaska's Eklutna project and Hawaiian Electric Co will add 80 Mw by 1955

Expenditures—Thousands of Dollars

	Fuel	Hydro	Transmission	Distribution	Miscellaneous	Total	Maintenance
Hawaii							
1952	706	.....	475	1,888	119	3,188	1,531
1953	6,000	.....	1,435	1,868	210	9,513	3,220
1954	7,290	.....	1,715	1,560	328	10,893	2,995
Alaska & Puerto Rico							
1952	.....	17,805†	1,982	4,415	1,155	25,357	1,578
1953	2,046	3,058	1,510	4,386	875	11,875	2,959
1954	6,150	33,600	2,680	5,790	1,850	50,070	3,300
Total							
1952	706	17,805	2,457	6,303	1,274	28,545	3,109
1953	8,046	3,058	2,945	6,254	1,085	21,388	6,179
1954	13,440	33,600	4,395	7,350	2,178	60,963	6,295

Transmission & Distribution

	Construction					Expenditures			
	Transmission—Circuit Miles		Primary Distribution—Pole Miles		Substations—Kva	Transmission Line	Primary Distribution Line		Substations
	66 kv & up	22-65.9 kv	Total	Rural			Total	Rural	
Hawaii									
1953	..	4	37	3	17,200	$712,000	$1,150,000	$20,000	$390,000
1954	..	9	34	4	52,000	$260,000	$1,050,000	$19,000	$565,000
Alaska & Puerto Rico									
1953	..	49	420	270	87,800	$717,900	$3,963,000	$1,129,700	$6,917,000
1954	79	26	460	410	64,000	$1,830,000	$4,340,000	$2,060,000	$1,095,000
Total									
1953	..	53	457	273	105,000	$1,429,900	$5,113,000	$1,149,700	$7,307,000
1954	79	35	494	414	116,000	$2,090,000	$5,390,000	$2,079,000	$1,660,000

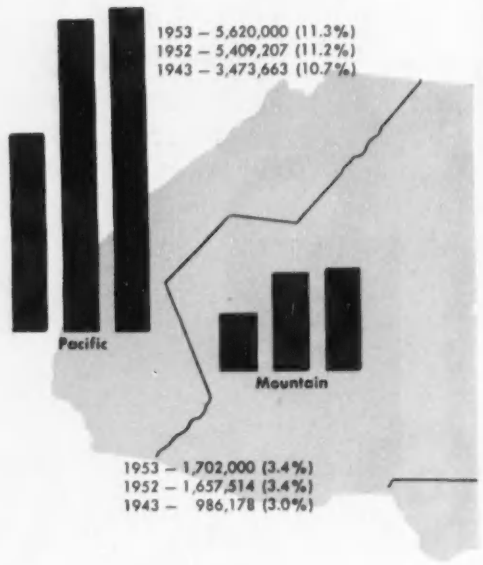
Capacity Additions Reported to Electrical World—Kw

	Prime Mover	Capacity End 1953	1953	1954	1955	1956	After 1956	Total Additions Now Planned
Eklutna Project, Alaska	Hydro	.....	.....	.....	30,000	.....	.....	30,000
Fairbanks, Alaska	Steam	3,500	.....	5,500	.....	.....	.....	5,500
Ketchikan, Alaska	Hydro	5,800	.....	4,000	.....	.....	.....	4,000
	IC	942	.....	.....	.....	.....	.....	.....
	Total	6,742	.....	4,000	.....	.....	.....	4,000
Kodiak, Alaska	IC	1,380	.....	650	.....	.....	.....	650
Hawaiian Electric Co	Steam	197,500	.....	.....	50,000	.....	.....	50,000
Maui Electric Co	Hydro	60	.....	.....	.....	.....	.....	.....
	Steam	10,000	.....	11,500	.....	.....	.....	11,500
	Total	10,060	.....	11,500	.....	.....	.....	11,500
Puerto Rico Water Resources Authority	Hydro	77,560	4,000	8,000	20,000	.....	.....	28,000
	Steam	124,625	20,000	.....	.....	40,000	40,000	80,000
	Total	202,185	24,000	8,000	20,000	40,000	40,000	108,000
Total	Hydro	83,420	4,000	12,000	50,000	.....	.....	66,000
	Steam	335,625	20,000	20,000	50,000	40,000	40,000	150,000
	IC	2,322	.....	650	.....	.....	.....	650
	Total	421,367	24,000	32,650	100,000	40,000	40,000	212,650

Source: "Electrical World" Surveys. † Includes fuel.

50 Million Customers Served During '53

The electrical industry added almost 1.5 million customers in 1953. The tapering-off trend seen in the past few years continued as most homes have been electrified. The residential group showed the largest increase, 1.2 million, bringing its total to 42 million, or 84% of total customers served.



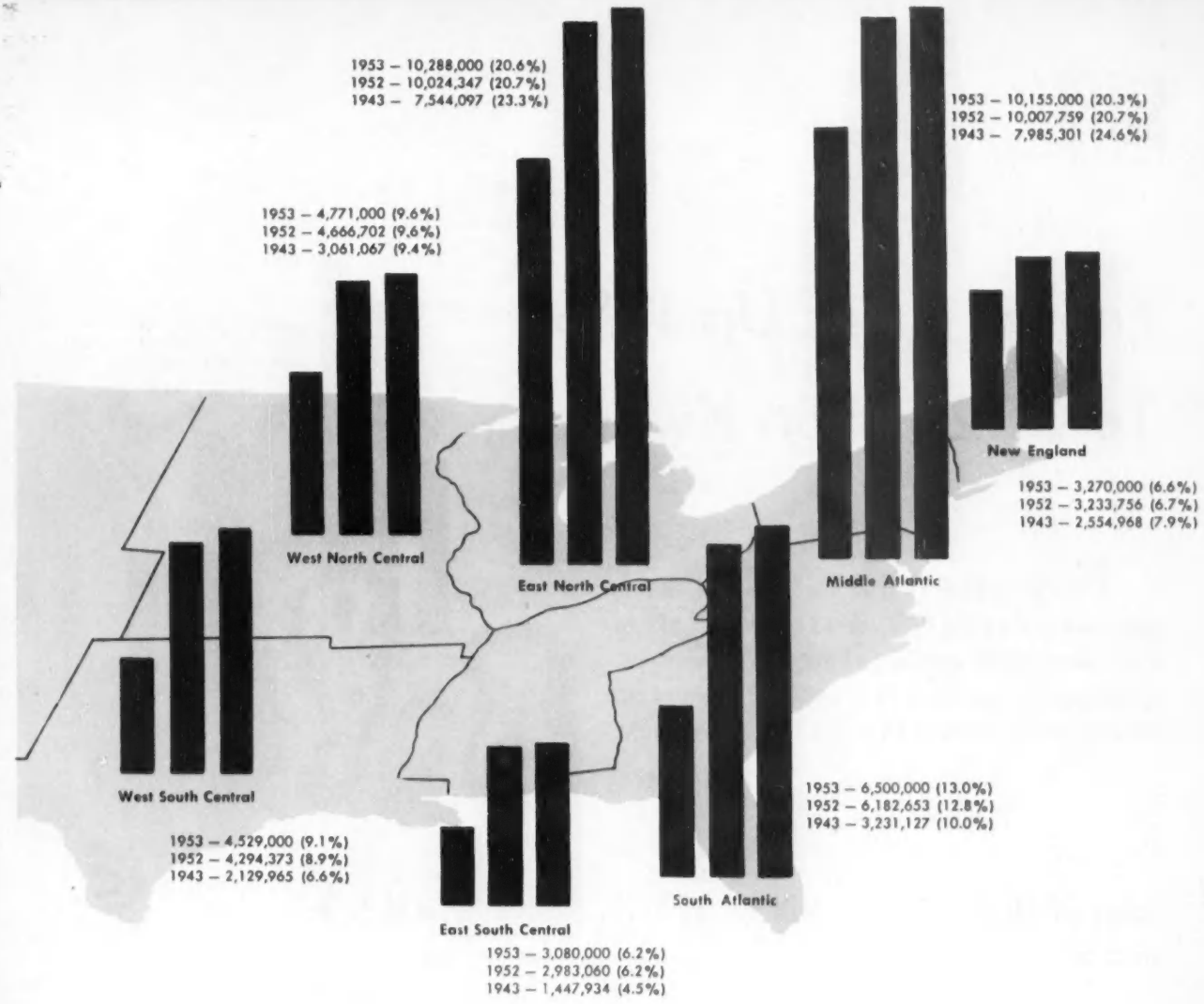
Customers and % Total U. S. ➡

Source: Edison Electric Institute, 1953 estimated. All bars from left to right: 1943, 1952, 1953

Customers

	Residential			Rural*			Small Light and Power			Large Light and Power		
	Customers	% Total	Annual Change	Customers	% Total	Annual Change	Customers	% Total	Annual Change	Customers	% Total	Annual Change
1937	22,378,385	82.1		518,882	1.9		4,071,633	14.9		197,262	0.7	
1938	23,111,762	82.3	739,377 (3.3%)	526,236	1.9	7,356 (1.4%)	4,127,357	14.7	55,724 (1.4%)	191,722	0.7	−5,540 (2.8%)
1939	23,965,035	82.3	853,273 (3.7%)	634,249	2.2	108,011 (20.5%)	4,215,254	14.5	87,897 (2.1%)	184,299	0.6	−7,423 (3.9%)
1940	24,951,906	82.6	986,871 (4.1%)	685,812	2.3	51,563 (8.1%)	4,260,255	14.1	45,001 (1.1%)	177,905	0.6	−6,394 (3.5%)
1941	26,025,513	82.3	1,073,607 (4.3%)	986,719	3.1	300,907 (43.9%)	4,299,976	13.6	39,721 (0.9%)	172,677	0.6	−5,228 (2.9%)
1942	26,680,456	82.6	594,943 (2.3%)	1,095,512	3.4	108,793 (11.0%)	4,219,457	13.1	−80,519 (1.9%)	149,928	0.5	−22,749 (13.2%)
1943	26,879,639	82.9	252,183 (0.9%)	1,088,698	3.4	−6,814 (0.6%)	4,168,245	12.8	−51,212 (1.2%)	146,593	0.5	−3,335 (2.2%)
1944	27,371,260	82.8	498,621 (1.9%)	1,144,241	3.5	55,543 (5.1%)	4,263,395	12.9	95,150 (2.3%)	151,652	0.4	5,059 (3.5%)
1945	28,116,998	82.6	745,738 (2.7%)	1,234,441	3.6	90,200 (7.9%)	4,398,184	12.9	134,789 (3.2%)	162,338	0.5	10,686 (7.0%)
1946	29,769,107	82.3	1,652,109 (5.9%)	1,381,291	3.8	146,850 (11.9%)	4,692,850	13.0	294,666 (6.7%)	174,662	0.5	12,324 (7.6%)
1947	31,621,959	82.2	1,852,852 (6.2%)	1,522,136	4.0	140,845 (10.2%)	4,960,895	12.9	268,045 (5.7%)	191,363	0.5	16,701 (9.6%)
1948	33,549,396	82.4	1,927,437 (6.1%)	1,694,579	4.1	172,443 (11.3%)	5,131,730	12.6	170,835 (3.4%)	204,230	0.5	12,867 (6.7%)
1949	35,375,366	82.6	1,825,970 (5.4%)	1,804,415	4.2	109,836 (6.5%)	5,290,768	12.3	159,038 (3.1%)	232,125	0.5	27,895 (13.7%)
1950	37,532,549	83.4	2,157,183 (6.1%)	1,596,146	3.5	−208,269 (11.5%)	5,466,181	12.2	175,413 (3.3%)	234,728	0.5	2,603 (1.1%)
1951	39,224,621	83.8	1,692,072 (4.5%)	1,658,728	3.5	62,582 (3.9%)	5,598,117	11.8	61,936 (1.1%)	247,532	0.5	12,804 (5.5%)
1952	40,747,518	84.1	1,522,897 (3.9%)	1,663,201	3.4	4,473 (2.7%)	5,634,130	11.6	106,013 (1.9%)	256,994	0.5	8,762 (3.5%)
1953‡	41,977,000	84.1	1,229,482 (3.0%)	1,625,000	3.3	−38,201 (2.3%)	5,873,000	11.8	238,870 (4.2%)	279,000	0.6	22,706 (8.9%)

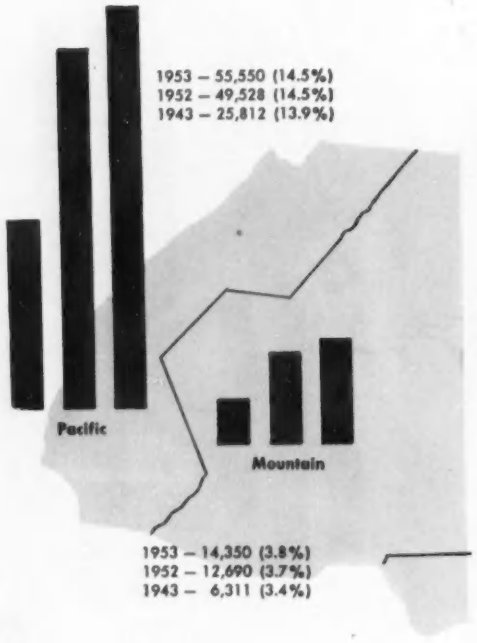
Source: Edison Electric Institute. *Customers served under distinctly rural rates. ‡Estimated.



Street & Highway Lighting		Other Public Authorities		Electric Traction		Interdepartmental		Total		
Customers	Annual Change	Customers	Annual Change	Customers	Annual Change	Customers	Annual Change	Customers	Annual Change	
24,292	.....	75,837	.....	375	.....	1,653	.....	27,262,319	.....	1937
24,165	−127 (0.5%)	80,928	5,091 (6.7%)	264	−111	1,274	−379	28,063,710	801,391 (2.9%)	1938
25,032	867 (3.6%)	80,078	−850 (1.1%)	238	−26	1,121	−153	29,105,306	1,041,596 (3.7%)	1939
24,147	−885 (3.5%)	89,480	9,402 (11.7%)	225	−13	1,271	150	30,191,001	1,085,695 (3.7%)	1940
24,932	785 (3.3%)	95,948	6,468 (7.2%)	225	0	1,381	110	31,607,371	1,416,370 (4.7%)	1941
25,216	284 (1.1%)	98,465	2,517 (2.6%)	211	−14	1,195	−186	32,210,440	603,069 (1.9%)	1942
25,465	249 (1.0%)	93,311	−5,154 (5.2%)	200	−11	1,149	−46	32,396,300	185,860 (0.6%)	1943
24,966	−499 (2.0%)	91,588	−1,723 (1.8%)	217	17	1,073	−76	33,048,392	652,092 (2.0%)	1944
25,607	641 (2.6%)	92,144	556 (0.6%)	211	−6	1,150	77	34,031,073	982,681 (3.0%)	1945
26,446	839 (3.3%)	94,643	2,499 (2.7%)	194	−17	1,098	−52	36,140,291	2,109,218 (6.2%)	1946
28,976	2,530 (9.6%)	105,665	11,022 (11.6%)	169	−25	787	−311	38,431,950	2,291,659 (6.3%)	1947
30,344	1,368 (4.7%)	110,779	5,114 (4.8%)	152	−17	778	−9	40,721,988	2,290,038 (6.0%)	1948
31,599	1,255 (4.1%)	115,530	4,751 (4.3%)	147	−5	831	53	42,850,781	2,128,793 (5.2%)	1949
33,679	2,080 (6.6%)	121,972	6,442 (5.6%)	145	−2	894	63	44,986,294	2,135,513 (5.0%)	1950
34,719	1,040 (3.1%)	127,115	5,143 (4.2%)	142	−3	905	11	46,821,879	1,835,585 (4.1%)	1951
36,373	1,654 (4.8%)	120,704	−6,411 (5.0%)	129	−13	1,022	117	48,459,371	1,637,492 (3.5%)	1952
37,150	777 (2.1%)	122,650	1,946 (1.6%)	125	−4	1,075	53	49,915,000	1,455,629 (3.0%)	1953

Energy Sales Up 12% To 382 Billion Kwhr

Over 382 billion kwhr of energy were sold last year, outranking the 1952 record by some 40 billion kwhr. Residential and large light and power sales, which together make up ¾ of the total energy sold, showed annual gains of 12% and 13% respectively.



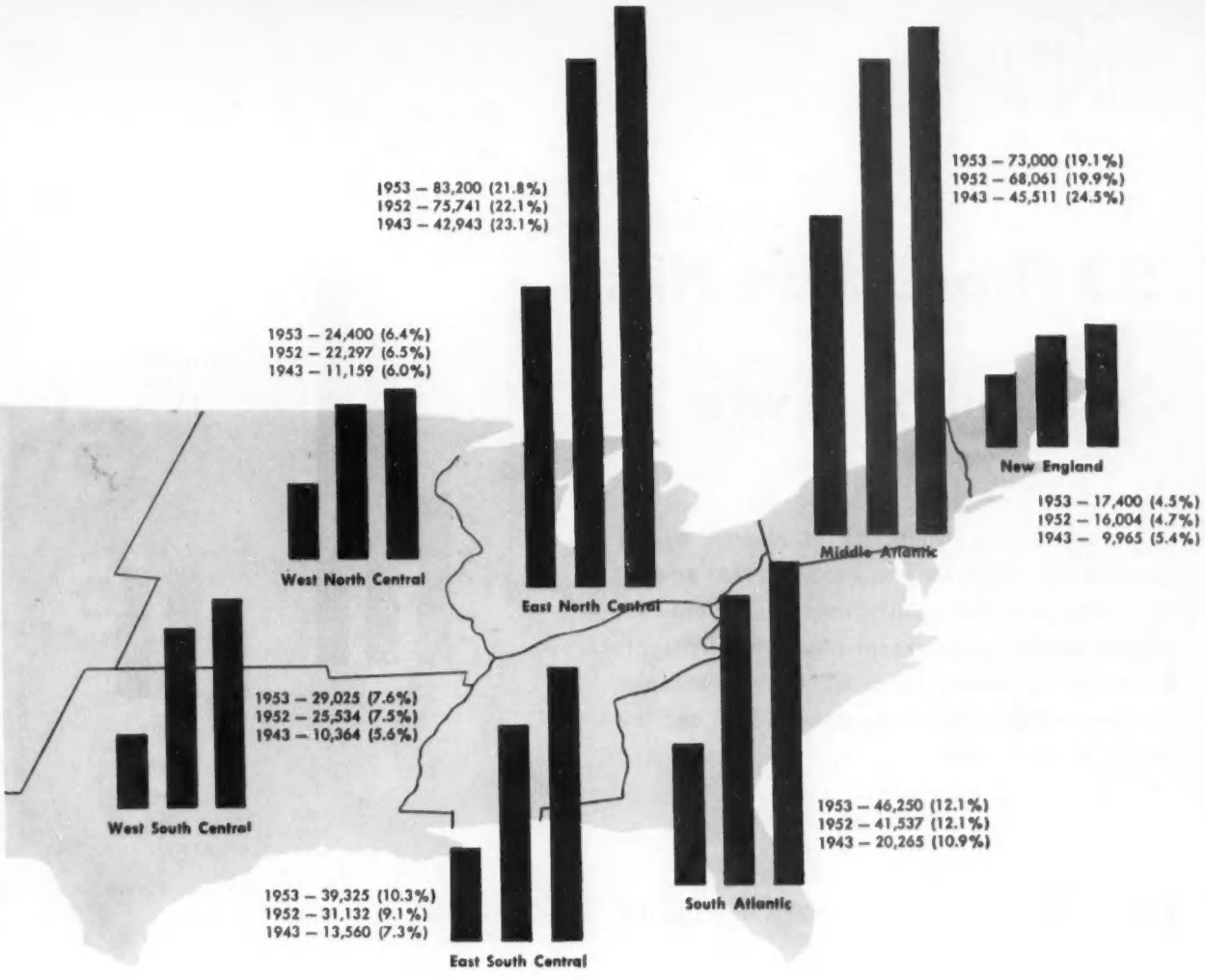
Sales of Electric Energy—Millions of Kwhr and % Total U. S.

Source: Edison Electric Institute, 1953 estimated. All bars from left to right: 1943, 1952, 1953

Sales of Electric Energy—Millions of Kwhr

	Residential			Rural*			Small Light & Power			Large Light & Power		
	Sales	% Total	Annual Change	Sales	% Total	Annual Change	Sales	% Total	Annual Change	Sales	% Total	Annual Change
1937....	17,691	17.8	.....	1,670	1.7	.....	18,075	18.2	.....	51,359	51.7	.....
1938....	19,371	20.7	1,680 (9.5%)	1,577	1.7	−93 (5.6%)	19,137	20.4	1,062 (5.9%)	43,140	46.0	−8,219 (16.0%)
1939....	21,084	19.9	1,713 (8.9%)	1,881	1.7	304 (19.3%)	20,722	19.6	1,585 (8.3%)	51,108	48.3	7,968 (18.5%)
1940....	23,317	19.7	2,233 (10.6%)	1,991	1.7	110 (5.82%)	22,373	18.8	1,651 (8.0%)	59,557	50.2	8,449 (16.5%)
1941....	25,124	17.9	1,807 (7.7%)	2,352	1.7	361 (18.1%)	24,628	17.6	2,255 (10.1%)	76,061	54.3	16,504 (27.7%)
1942....	26,937	16.9	1,813 (7.2%)	2,890	1.8	538 (22.9%)	27,233	17.1	2,605 (10.6%)	88,378	55.4	12,317 (16.2%)
1943....	28,621	15.4	1,684 (6.3%)	2,996	1.6	106 (3.7%)	28,192	15.2	959 (3.5%)	106,657	57.4	18,279 (20.7%)
1944....	31,266	15.7	2,645 (9.2%)	3,373	1.7	377 (12.6%)	29,837	15.1	1,645 (5.8%)	115,187	58.1	8,530 (8.0%)
1945....	34,184	17.7	2,918 (9.3%)	3,669	1.9	296 (8.8%)	30,438	15.7	601 (2.0%)	107,490	55.5	−7,697 (6.7%)
1946....	38,571	20.9	4,387 (12.8%)	4,431	2.3	762 (20.8%)	33,016	17.3	2,578 (8.5%)	98,885	51.8	−8,605 (8.0%)
1947....	44,171	20.3	5,600 (14.5%)	5,551	2.5	1,120 (25.3%)	38,379	17.6	5,363 (16.2%)	113,523	52.2	14,638 (14.8%)
1948....	50,978	21.2	6,807 (15.4%)	6,327	2.6	776 (14.0%)	43,193	17.9	4,814 (12.5%)	124,088	51.6	10,565 (9.3%)
1949....	58,139	23.4	7,161 (14.0%)	7,384	3.0	1,057 (16.7%)	46,962	18.6	3,069 (7.1%)	120,766	48.6	−3,322 (2.7%)
1950....	67,030	23.9	8,891 (15.3%)	7,400	2.6	16 (0.2%)	50,446	18.0	4,184 (9.0%)	139,065	49.5	18,299 (15.2%)
1951....	77,024	24.2	9,994 (14.9%)	8,479	2.7	1,079 (14.6%)	57,278	18.0	6,832 (13.5%)	157,827	49.6	18,762 (13.5%)
1952....	86,780	25.3	9,756 (12.7%)	9,536	2.5	57 (0.7%)	62,080	18.1	4,802 (8.4%)	167,358	48.9	9,531 (6.0%)
1953‡...	96,800	25.3	10,020 (11.5%)	9,550	2.5	1,014 (11.9%)	68,200	17.8	6,120 (9.9%)	189,600	49.6	22,242 (13.3%)

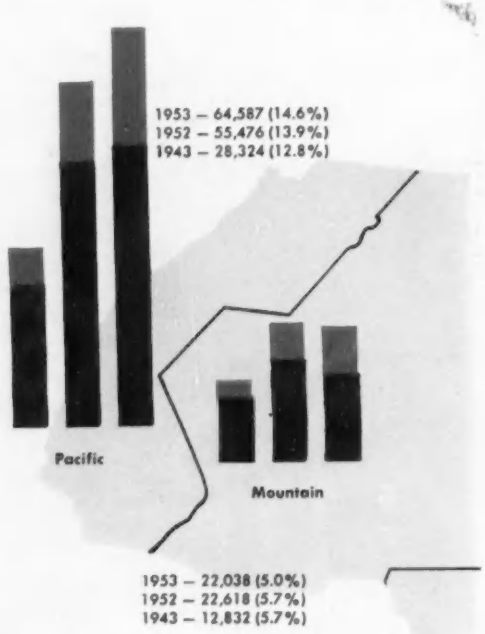
Source: Edison Electric Institute. * Sales on distinct rural rates. ‡ Estimated.



Street & Highway Lighting			Other Public Authorities			Electric Traction			Interdepartmental		Total		
Sales	% Total	Annual Change	Sales	% Total	Annual Change	Sales	% Total	Annual Change	Sales	Annual Change	Sales	Annual Change	
1,863	1.9	.....	2,403	2.4	.....	5,712	5.7	.....	586	.....	99,359	.....	1937
1,929	2.0	66 (3.5%)	2,451	2.6	48 (2.0%)	5,438	5.8	−274(4.8%)	688	102	93,751	−5,608 (5.6%)	1938
2,002	1.9	73 (3.4%)	2,538	2.4	87 (3.5%)	5,765	5.5	327(6.0%)	667	−21	105,767	12,016 (12.8%)	1939
2,048	1.7	46 (2.3%)	2,720	2.3	182 (7.2%)	5,910	5.0	145(2.5%)	727	60	118,643	12,876 (12.2%)	1940
2,110	1.5	62 (3.0%)	3,093	2.2	373 (13.7%)	6,078	4.3	168(2.8%)	614	−113	140,060	21,957 (18.5%)	1941
2,061	1.3	−49 (2.3%)	4,206	2.6	1,113 (36.0%)	6,628	4.2	550(9.0%)	1,074	460	159,407	19,807 (13.4%)	1942
2,075	1.1	14 (0.7%)	9,139	4.9	4,933 (117.3%)	7,226	3.9	598(9.0%)	983	−91	185,889	26,482 (16.6%)	1943
2,163	1.1	88 (4.2%)	8,463	4.3	−676 (7.4%)	7,328	3.7	102(1.4%)	543	−440	198,160	12,271 (6.6%)	1944
2,184	1.1	21 (1.0%)	7,589	3.9	−874 (10.3%)	7,354	3.8	26(0.4%)	650	107	193,558	−4,602 (2.3%)	1945
2,272	1.2	88 (4.0%)	5,854	3.1	−1,735 (22.9%)	7,147	3.8	−207(2.8%)	619	−31	190,795	−2,763 (1.4%)	1946
2,365	1.1	93 (4.1%)	5,916	2.7	62 (1.1%)	7,105	3.3	−42(0.5%)	571	−48	217,581	26,786 (14.0%)	1947
2,525	1.0	160 (6.8%)	6,255	2.6	339 (5.7%)	6,720	2.8	−385(5.4%)	654	83	240,740	23,159 (10.6%)	1948
2,725	1.1	200 (7.9%)	6,583	2.6	328 (5.2%)	6,112	2.5	−608(9.0%)	571	−83	248,542	7,802 (3.2%)	1949
2,976	1.1	251 (9.2%)	7,163	2.6	580 (8.8%)	5,881	2.1	−231(3.8%)	578	7	280,539	31,997 (12.9%)	1950
3,285	1.0	309 (10.4%)	7,987	2.5	824 (11.5%)	5,761	1.8	−120(2.0%)	527	−51	318,168	37,629 (13.4%)	1951
3,522	1.0	237 (7.2%)	8,435	2.5	448 (5.6%)	5,353	1.6	−408(7.1%)	460	−67	342,524	24,356 (7.7%)	1952
3,790	0.9	268 (7.6%)	8,980	2.3	545 (6.5%)	5,000	1.3	−353(6.6%)	580	120	382,500	39,976 (11.7%)	1953

'53 Production Hits 442 Billion Kwhr

Industry-wide production of electric energy totalled 442 billion kwhr in 1953. Of that amount 76% was from fuel generation, 24% hydro. All regions showed gains except Mountain. Droughts here affected hydro production. Power companies produced 80%, federal agencies 13%, and all others 7% of the total.



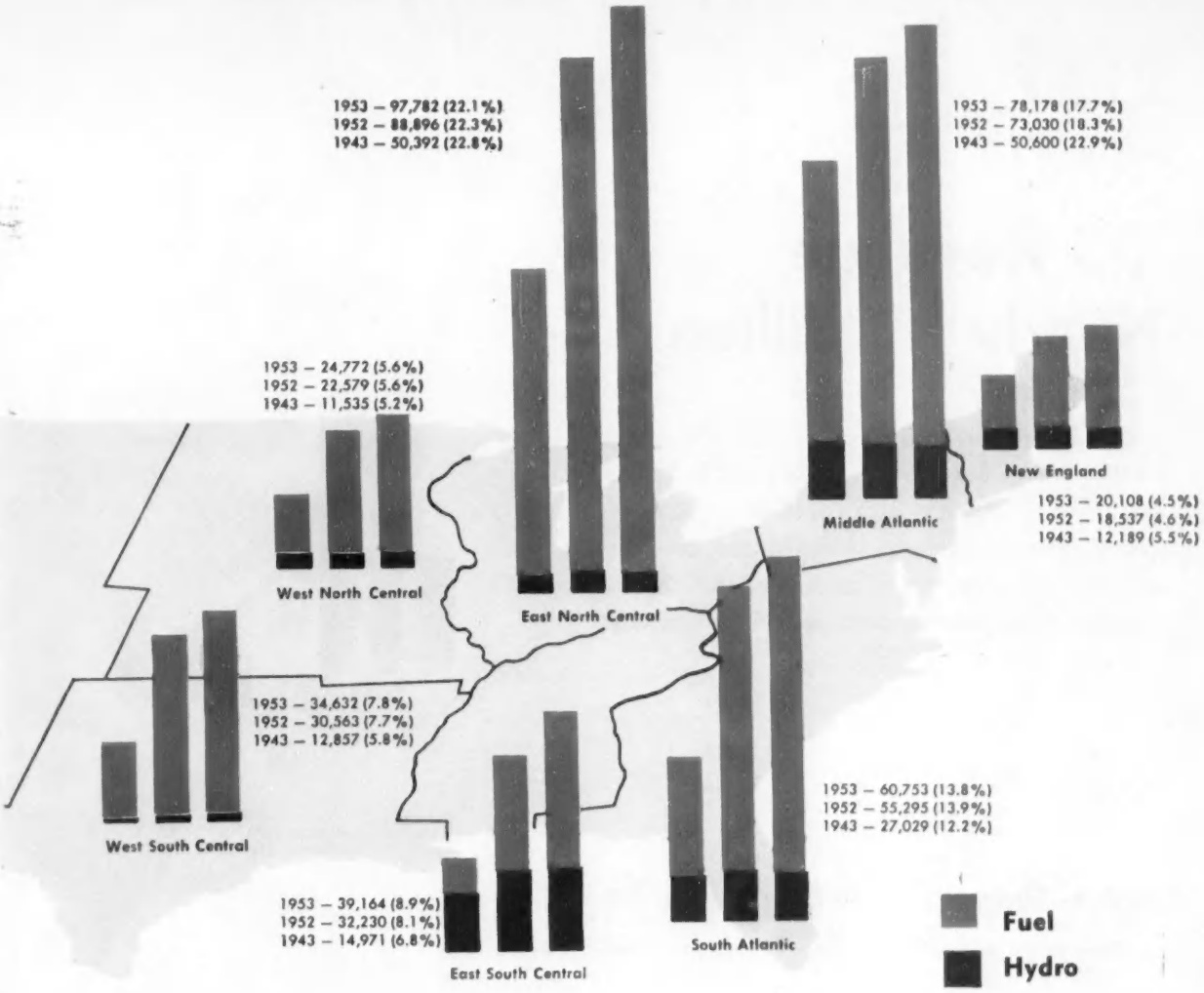
Energy Production—Millions of Kwhr and % Total U. S.

Source: Federal Power Commission, 1953 estimated. All bars left to right: 1943, 1952, 1953

Source and Disposal of Energy—Millions of Kwhr

	Production Fuel	Production Hydro	Total Production	Add Net Imports	Less Energy Used by Producer	Total for Distribution	Losses	Sales to Ultimate Consumers
1937	74,900	44,013	118,913	1,733	6,428	114,218	14,859	99,359
1938	69,533	44,279	113,812	1,867	6,990	108,689	14,958	93,731
1939	84,078	43,564	127,642	1,900	7,734	121,808	16,040	105,768
1940	94,516	47,321	141,837	937	7,268	135,506	16,863	118,643
1941	113,925	50,863	164,788	927	6,335	159,380	19,320	140,060
1942	122,108	63,871	185,979	1,448	6,611	180,816	21,409	159,407
1943	144,127	73,632	217,759	1,537	9,729	209,567	24,678	185,889
1944	154,244	73,945	228,189	1,597	6,541	223,245	25,084	198,161
1945	142,516	79,970	222,486	1,773	3,368	220,891	27,333	193,558
1946	144,772	78,406	223,178	1,666	4,576	220,268	29,474	190,794
1947	177,314	78,425	255,739	1,269	6,186	250,822	33,241	217,581
1948	200,228	82,470	282,698	1,113	6,368	277,443	36,703	240,740
1949	201,351	89,748	291,099	1,004	5,887	286,216	37,675	248,542
1950	233,203	95,938	329,141	1,283	8,445	321,979	41,440	280,539
1951	270,922	99,751	370,673	1,721	9,356	363,838	44,870	318,168
1952	294,121	105,102	399,224	1,758	10,731	390,251	47,727	342,524
1953*	336,959	105,055	442,014	1,400	10,000	433,400	50,900	382,500

Source: Federal Power Commission and Edison Electric Institute. All data revised to correspond with current basis which excludes former Mining and Manufacturing and Railroad and Railway classification. *Estimated.



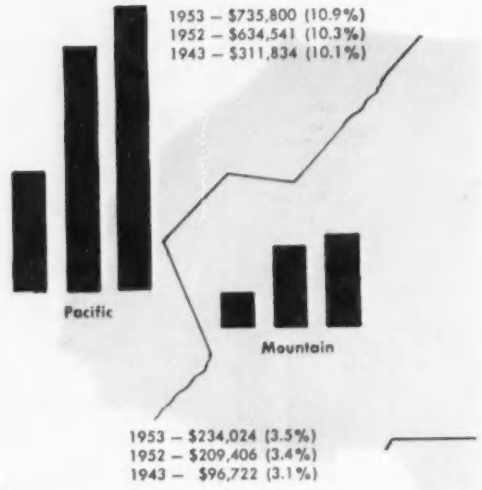
Production of Electric Energy by Ownership—Millions of Kwhr

	Power Companies		Federal		Municipal, State and Power District		Cooperatives	
	Production	% Total	Production	% Total	Production	% Total	Production	% Total
1937	110,464	92.9	1,843	1.6	6,606†	5.6	....	....
1938	104,090	91.5	3,029	2.7	6,693†	5.9	....	....
1939	115,078	90.2	5,476	4.3	7,088†	5.6	....	....
1940	125,411	88.4	8,583	6.1	7,843†	5.5	....	....
1941	144,289	87.6	10,794	6.6	9,705†	5.9	....	....
1942	158,052	85.0	16,894	9.1	11,033†	5.9	....	....
1943	180,248	82.8	24,484	11.2	13,027†	6.0	....	....
1944	185,850	81.4	28,866	12.7	13,473†	5.9	....	....
1945	180,926	81.3	28,000	12.6	13,560†	6.1	....	....
1946	181,021	81.1	26,960	12.1	15,198†	6.8	....	....
1947	208,106	81.4	29,877	11.7	17,350	6.9	406	0.2
1948	228,231	80.7	35,373	12.5	18,442	6.5	652	0.2
1949	233,112	80.1	38,102	13.1	19,120	6.6	766	0.3
1950	266,860	81.1	40,387	12.3	20,905	6.4	989	0.3
1951	301,845	81.4	44,120	11.9	23,442	6.3	1,266	0.3
1952	322,126	80.7	52,498	13.2	23,153	5.8	1,452	0.4
1953*	353,528	80.0	58,400	13.2	28,317‡	6.4	1,769‡	0.4

Source: Federal Power Commission. † Includes Cooperatives. * Estimated. ‡ Estimated by Electrical World.

'53 Revenue Nearly $7 Billion

In eight years total revenue from the sale of electric energy has more than doubled. In 1953 it amounted to $6.8 billion. In 1945 it was $3.3 billion. Continued increases in residential, commercial and industrial usage accounted for the increases. Together they make up 93% of the total.



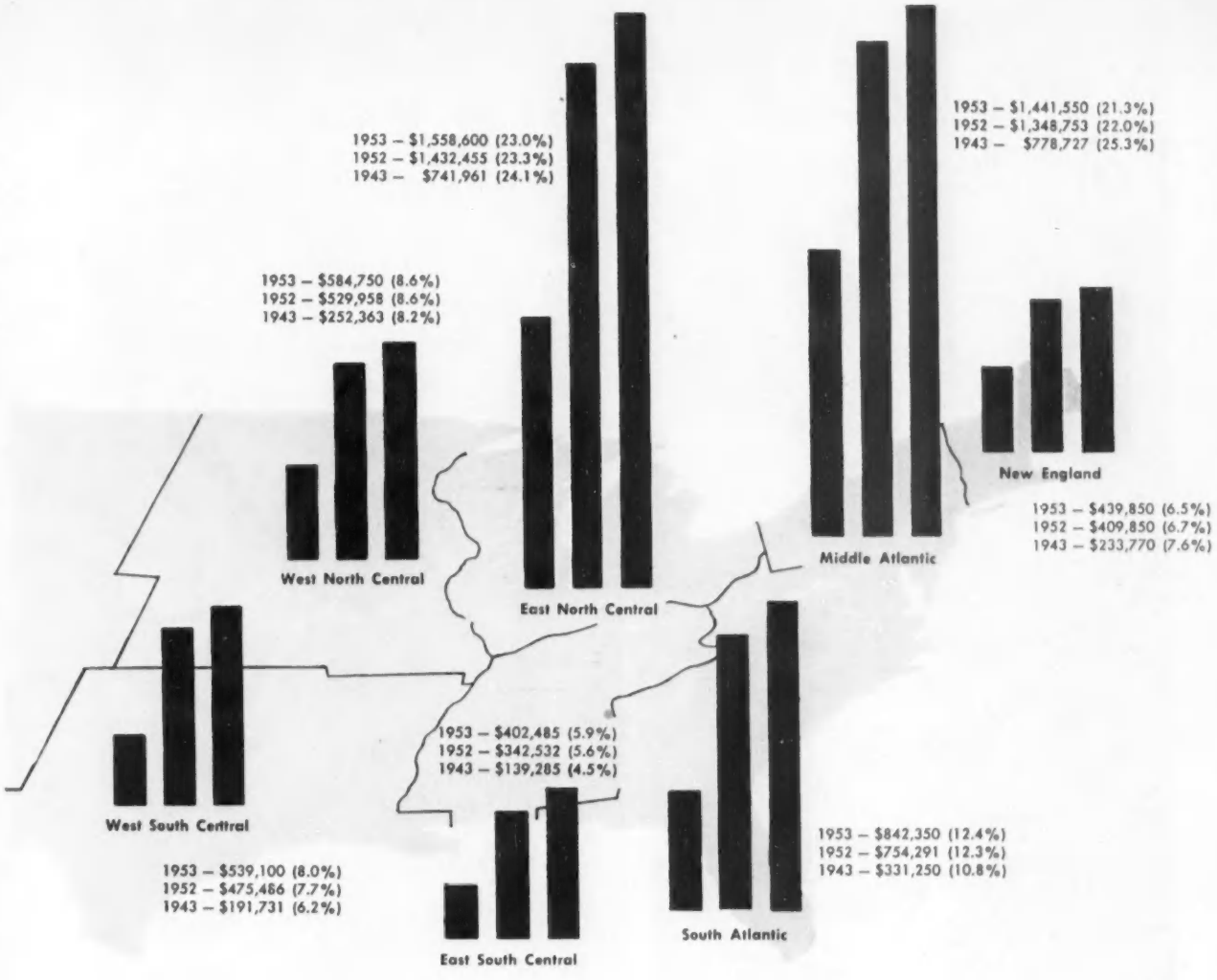
Revenue—Thousands of Dollars and % Total U.S.

Source: Edison Electric Institute, 1953 estimated. All bars from left to right: 1943, 1952, 1953

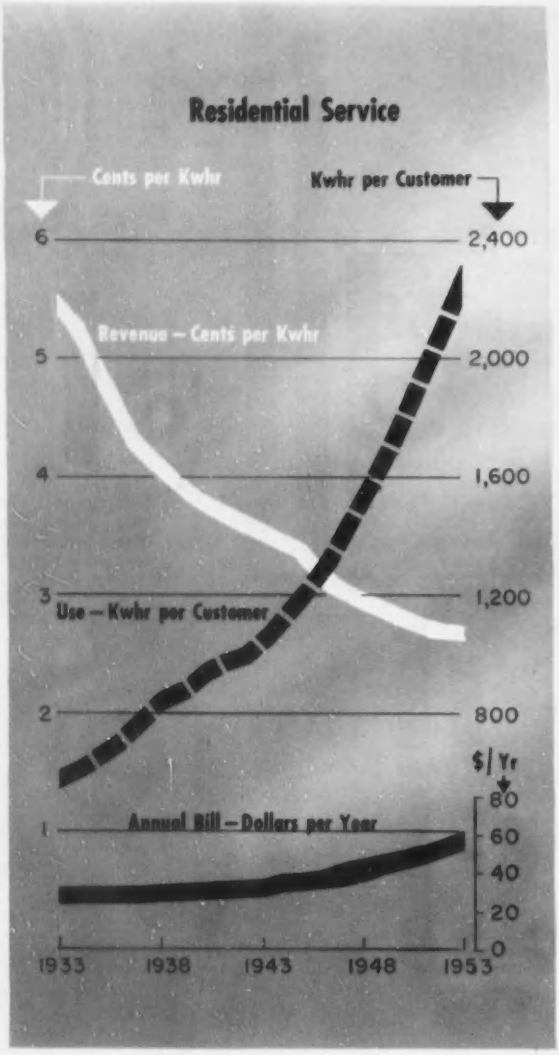
Revenue from Energy Sales—Thousands of Dollars

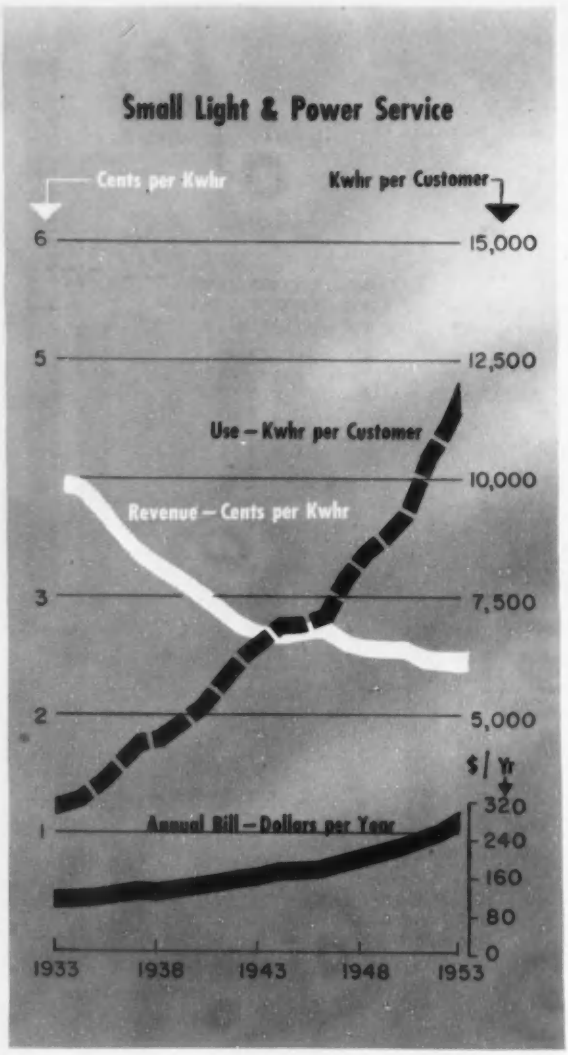
	Residential			Rural*			Small Light and Power			Large Light and Power		
	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change
1937..	759,894	35.2		37,726	1.7		616,438	28.5		583,197	27.0	
1938..	802,532	37.2	42,708 (5.6%)	38,928	1.8	1,202 (3.2%)	632,091	29.3	15,653 (2.5%)	518,694	24.1	−64,503 (11.1%)
1939..	843,158	36.8	40,626 (5.1%)	45,484	2.0	6,556 (16.8%)	660,683	28.9	28,592 (4.5%)	572,659	25.0	53,965 (10.4%)
1940..	895,951	36.7	52,793 (6.3%)	49,473	2.0	3,989 (8.8%)	689,253	28.2	28,570 (4.3%)	631,428	25.9	58,769 (10.3%)
1941..	938,229	35.2	42,278 (4.7%)	64,396	2.4	14,923 (30.2%)	725,117	27.2	35,864 (5.2%)	758,083	28.5	126,655 (20.1%)
1942..	990,185	34.7	51,956 (5.5%)	75,027	2.6	10,631 (16.5%)	767,279	26.9	42,162 (5.8%)	828,318	29.0	70,235 (9.3%)
1943..	1,029,260	33.4	39,075 (3.9%)	76,617	2.5	1,590 (2.1%)	773,678	25.2	6,399 (0.8%)	964,192	31.3	135,874 (16.4%)
1944..	1,097,796	33.5	68,466 (6.7%)	82,842	2.5	6,225 (8.1%)	817,355	24.9	43,677 (5.6%)	1,043,392	31.8	79,200 (8.2%)
1945..	1,167,356	34.9	69,630 (6.3%)	90,345	2.7	7,503 (9.1%)	850,213	25.4	32,858 (4.0%)	1,001,957	30.0	−41,435 (4.0%)
1946..	1,240,577	35.9	73,221 (6.3%)	104,876	3.0	14,531 (16.1%)	924,775	26.7	74,562 (8.8%)	969,349	28.0	−32,608 (3.3%)
1947..	1,366,498	35.5	125,921 (10.8%)	123,749	3.2	18,873 (18.0%)	1,031,335	26.8	106,560 (11.5%)	1,106,555	28.7	137,206 (14.1%)
1948..	1,532,664	35.5	166,166 (12.2%)	140,648	3.3	16,899 (13.7%)	1,159,783	26.7	121,448 (11.8%)	1,250,684	29.0	144,129 (13.0%)
1949..	1,716,533	37.2	183,869 (12.0%)	160,855	3.5	20,207 (14.4%)	1,228,726	26.6	75,943 (6.6%)	1,262,698	27.4	12,014 (1.0%)
1950..	1,931,696	38.0	215,163 (12.5%)	157,611	3.1	−3,244 (2.0%)	1,333,755	26.2	105,029 (8.5%)	1,404,980	27.6	142,282 (11.3%)
1951..	2,165,010	38.3	233,314 (12.1%)	175,431	3.1	17,820 (11.3%)	1,462,262	25.9	128,507 (9.6%)	1,571,932	27.8	166,952 (11.9%)
1952..	2,400,889	39.1	235,879 (10.9%)	184,479	3.0	9,048 (5.2%)	1,584,219	25.8	121,957 (8.3%)	1,684,073	27.4	112,141 (7.1%)
1953‡.	2,657,000	39.2	256,111 (10.7%)	203,000	3.0	18,521 (10.0%)	1,739,000	25.7	154,781 (9.8%)	1,879,000	27.7	194,927 (11.6%)

Source: Edison Electric Institute. * Revenue from sales under distinctly rural rates. ‡ Estimated.



Street and Highway Lighting			Other Public Authorities			Electric Traction			Interdepartmental		Total		
Revenue	% Total	Annual Change	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change	Revenue	Annual Change	Revenue	Annual Change	
72,740	3.4	.....	38,793	1.8	.....	47,780	2.2	.....	4,299	.....	2,160,797	.....	1937
74,323	3.4	1,583 (2.2%)	40,195	1.9	1,402 (3.6%)	45,506	2.1	−2,274 (4.8%)	4,311	12	2,156,580	−4,217 (0.2%)	1938
75,443	3.3	1,120 (1.5%)	40,796	1.8	601 (1.5%)	47,000	2.0	1,494 (3.3%)	4,360	49	2,289,583	133,003 (6.2%)	1939
76,052	3.1	609 (0.8%)	45,515	1.9	4,719 (11.6%)	47,808	2.0	808 (1.7%)	4,737	377	2,440,217	150,634 (6.6%)	1940
76,949	2.9	897 (1.2%)	49,203	1.8	3,688 (8.1%)	48,945	1.8	1,137 (2.4%)	4,135	−602	2,665,057	224,840 (9.2%)	1941
75,660	2.6	−1,289 (1.7%)	60,206	2.1	11,003 (22.4%)	53,632	1.9	4,687 (9.6%)	5,536	1,401	2,855,843	190,786 (7.2%)	1942
75,384	2.5	−276 (0.4%)	94,957	3.1	34,751 (57.7%)	58,099	1.9	4,467 (8.3%)	5,456	−80	3,077,643	221,800 (7.8%)	1943
76,626	2.4	1,242 (1.6%)	94,452	2.9	−505 (0.5%)	60,273	1.8	2,174 (3.7%)	4,085	−1,371	3,276,751	199,108 (6.5%)	1944
76,189	2.3	−437 (0.6%)	88,854	2.7	−5,598 (5.9%)	61,463	1.8	1,190 (2.0%)	5,141	1,056	3,341,518	64,767 (2.0%)	1945
77,570	2.3	1,381 (1.8%)	77,047	2.3	−11,807 (13.3%)	60,288	1.7	−1,175 (1.9%)	5,078	−63	3,459,560	118,042 (3.5%)	1946
78,181	2.0	611 (0.8%)	78,319	2.0	1,272 (1.7%)	63,035	1.6	2,747 (4.6%)	5,093	15	3,852,765	393,205 (11.4%)	1947
82,381	1.9	4,200 (5.4%)	84,890	2.0	6,571 (8.4%)	63,551	1.5	516 (0.8%)	5,712	619	4,313,313	460,548 (12.0%)	1948
88,087	1.9	5,706 (6.9%)	91,067	2.0	6,177 (7.3%)	60,752	1.3	−2,799 (4.4%)	5,351	−361	4,614,069	300,756 (7.0%)	1949
94,330	1.8	6,243 (7.1%)	99,696	2.0	8,629 (9.5%)	59,050	1.2	−1,702 (2.8%)	5,347	−4	5,086,465	472,396 (10.2%)	1950
101,250	1.8	6,920 (7.3%)	110,107	1.9	10,411 (10.4%)	56,896	1.0	−2,154 (3.6%)	4,784	−563	5,647,672	561,207 (11.0%)	1951
107,720	1.8	6,470 (6.4%)	117,461	1.9	7,354 (6.7%)	54,141	0.9	−2,755 (4.8%)	4,290	−494	6,137,272	489,600 (8.7%)	1952
116,100	1.7	8,380 (7.8%)	125,400	1.9	7,939 (6.8%)	53,800	0.8	−341 (0.6%)	5,700	1,410	6,779,000	641,728 (10.5%)	1953

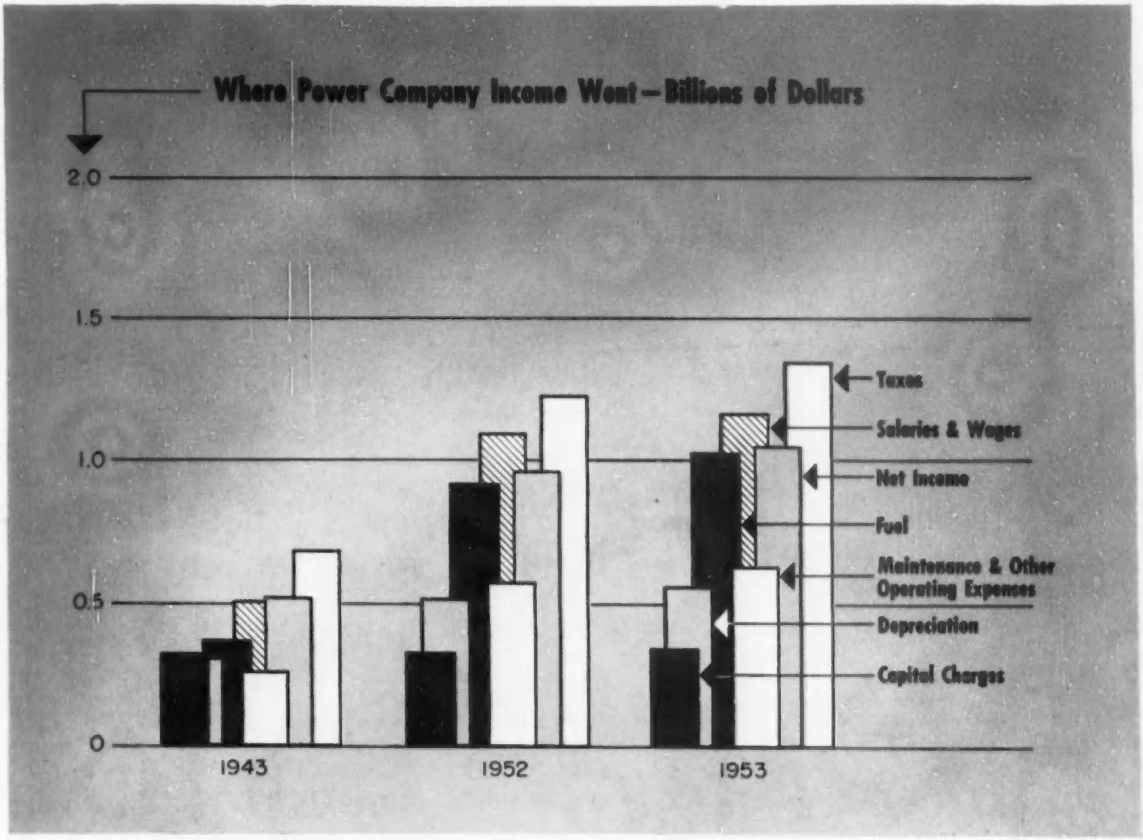




Average Use and Bill per Customer

	Residential					Small Light and Power				
	Average Use			Average Bill		Average Use			Average Bill	
	Kwhr	Change		per Kwhr	Annual	Kwhr	Change		per Kwhr	Annual
1937	805	70	(9.5%)	4.30¢	$34.62	4,578	435	(10.5%)	3.41¢	$156
1938	853	48	(6.0%)	4.14¢	$35.31	4,668	90	(2.0%)	3.30¢	$154
1939	897	44	(4.9%)	4.00¢	$35.88	4,968	300	(6.4%)	3.19¢	$158
1940	952	55	(6.1%)	3.84¢	$36.56	5,280	312	(6.3%)	3.08¢	$163
1941	986	34	(3.6%)	3.73¢	$36.78	5,754	474	(9.0%)	2.94¢	$169
1942	1,022	36	(3.7%)	3.67¢	$37.51	6,354	600	(10.4%)	2.82¢	$179
1943	1,070	48	(4.7%)	3.60¢	$38.52	6,722	368	(5.8%)	2.74¢	$184
1944	1,151	81	(7.6%)	3.51¢	$40.40	7,080	358	(5.3%)	2.74¢	$194
1945	1,229	78	(6.8%)	3.41¢	$41.97	7,062	−18	(0.3%)	2.79¢	$197
1946	1,329	100	(8.1%)	3.22¢	$42.79	7,224	162	(2.3%)	2.80¢	$202
1947	1,438	109	(8.2%)	3.09¢	$44.43	7,915	691	(9.6%)	2.69¢	$213
1948	1,563	125	(8.7%)	3.01¢	$47.05	8,535	620	(7.8%)	2.67¢	$228
1949	1,684	121	(7.7%)	2.95¢	$49.68	8,871	336	(3.9%)	2.66¢	$236
1950	1,830	146	(8.7%)	2.88¢	$52.70	9,320	449	(5.1%)	2.64¢	$246
1951	2,004	174	(9.5%)	2.81¢	$56.31	10,432	1,112	(11.9%)	2.55¢	$266
1952	2,169	165	(8.2%)	2.77¢	$60.08	11,106	674	(6.5%)	2.55¢	$283
1953	2,350	181	(8.3%)	2.75¢	$64.76	11,875	769	(6.9%)	2.55¢	$303

Source: Edison Electric Institute.



Net Income Passed $1 Billion in 1953

A new high was hit in 1953 for operating revenues of the electric power companies, enabling net income to pass the $1 billion mark for the first time in the history of these companies.

Electric plant totaled $25.7 billion, another record. This is over twice the electric plant of $11.8 billion in operation at the end of 1943. To help finance the $2.8 billion construction program in 1953, the electric companies sold nearly $2 billion in securities, a new record high. Of this amount $1,739 million was sold publicly and over $217 million was placed with institutional investors. Some of these securities were sold when bond prices sank to new postwar lows during the year.

Revenues Hit Record . . . Total operating revenues hit a new peak when they soared to $5,940 million as compared with $5,426 million the previous year. This is over 100% growth in revenues since 1943 when they amounted to only $2.8 billion.

Expenses Continue to Mount . . . While revenues showed record breaking increases, operating expenses likewise continued to go up, reaching $2.8 billion which was the total operating revenues of the industry for the entire year of 1943. Fuel registered the largest percentage increase being up 11.5% over 1952. This was due to a 13.8% increase in fuel generation and only 2.3% in hydro. Another factor was a hike of 12¢ a ton in the average increase of the cost of coal. Because of increased efficiencies in fuel plants, electric companies were able to save around 39 million tons of coal based on a com-

Power Companies Composite Income Statement—Millions of Dollars

	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953*
Total Electric Revenue	2,816	2,955	3,012	3,127	3,480	3,886	4,113	4,510	5,005	5,426	5,940
Operating Expenses	1,127	1,225	1,259	1,385	1,701	2,019	2,030	2,158	2,400	2,577	2,813†
Depreciation	307	319	322	324	339	364	389	438	475	513	557
Total Expenses	1,434	1,544	1,581	1,709	2,040	2,383	2,419	2,596	2,875	3,090	3,370
Electric Operating Income before Taxes	1,382	1,411	1,431	1,418	1,440	1,503	1,694	1,914	2,130	2,336	2,570
Taxes	680	677	652	644	664	712	794	948	1,150	1,224	1,338
Electric Operating Income after Taxes	702	734	779	774	776	791	900	966	980	1,112	1,232
Other Income [1]	132	125	126	130	125	118	132	147	154	166	151
Gross Corporate Income	834	859	905	904	901	909	1,032	1,113	1,134	1,278	1,383
Capital Charges [2]	322	342	360	258	245	243	267	282	311	322	338
Net Income	512	517	545	646	656	666	765	831	823	956	1,045
Dividends	418	406	415	466	500	499	566	626	658	732	788
Surplus	94	111	130	180	156	167	199	205	165	224	257

Source: Federal Power Commission & Edison Electric Institute. * Estimated. [1] Includes revenues of gas, water, and steam departments and interest on securities held. [2] Includes amortization and interest on long term debt. † Includes Federal Income Tax deferment of $14 million arising from amortization of emergency facilities.

Distribution of Revenue Dollar—Percent

	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953*
Fuel	12.3	13.1	12.2	13.1	16.6	19.4	16.6	16.3	16.7	16.4	16.8
Salaries and Wages	17.1	17.5	18.0	18.5	20.6	20.4	20.3	19.9	19.9	19.4	19.0
Maintenance and Other Operating Expenses	8.8	9.1	9.8	11.0	10.0	10.6	10.9	10.1	9.9	10.2	10.3
Depreciation	10.4	10.4	10.3	9.9	9.4	9.1	9.2	9.4	9.2	9.2	9.1
Fixed Charges	10.9	11.1	11.5	7.9	6.8	6.1	6.3	6.1	6.0	5.8	5.5
Taxes	23.1	22.0	20.8	19.8	18.4	17.8	18.7	20.4	22.3	21.9	22.0
Dividends and Surplus	17.4	16.8	17.4	19.8	18.2	16.6	18.0	17.8	16.0	17.1	17.3
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Federal Power Commission and Edison Electric Institute. * Estimated.

Security Sales by Electric Light and Power Companies—Thousands of Dollars

	Bonds, Debentures, etc.		Stocks, Common and Preferred		Distribution of Security Sales		
	Public Investors	Institutional Investors		Total Financing	New Capital	Refunding	Total Issues
1937	522,613	37,604	86,095	646,312	81,984	563,699	645,682
1938	750,549	192,762	20,694	964,005	123,056	840,949	964,005
1939	620,205	252,625	123,517	996,347	16,219	980,128	996,347
1940	660,716	188,976	139,767	989,459	92,376	897,083	989,459
1941	368,712	255,912	116,208	740,832	97,065	643,767	740,832
1942	226,800	99,688	29,766	356,254	92,666	263,588	356,254
1943	329,300	26,850	14,912	371,062	9,921	361,141	371,062
1944	851,743	103,950	62,535	1,018,228	15,587	1,002,641	1,018,228
1945	1,113,603	121,051	127,268	1,361,922	39,699	1,322,253	1,361,922
1946	633,966	64,040	384,441	1,082,447	172,846	909,601	1,082,447
1947	1,039,517	153,159	384,699	1,577,375	567,729	1,009,646	1,577,375
1948	996,641	156,525	297,460	1,450,626	1,314,456	136,170	1,450,626
1949	959,978	192,280	640,953	1,793,211	1,444,826	348,385	1,793,211
1950	838,108	278,389	591,340	1,707,837	1,300,040	407,797	1,707,837
1951	778,308	110,696	552,943	1,441,947	1,432,257	9,690	1,441,947
1952	929,167	145,860	630,652	1,705,679	1,693,514	12,165	1,705,679
1953	973,075	217,022	766,594	1,956,691	1,938,815	17,876	1,956,691

Source: Irving Trust Co.

parison with 1943 figures. This was equal to $250 million in value at prevailing 1953 coal prices. Salaries and wages, the second largest expense, accounted for 19¢ of every dollar received. In 1953 operating expenses included $14 million deferment arising from amortization of emergency facilities certified under Section 124A of the U. S. Internal Revenue Code. Fuel, salaries and wages, and maintenance and other operating expenses took 46.1¢ of every dollar received by electric companies in 1953.

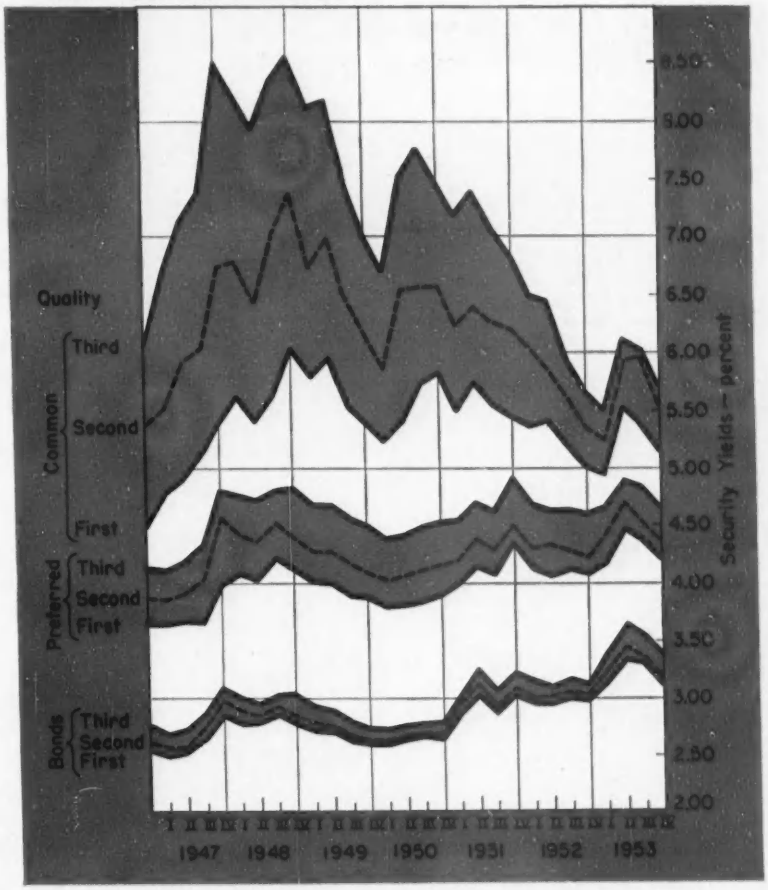
Depreciation at New High . . . Depreciation charges totaled $557 million in 1953 as compared with $513 million the previous year. This increase was primarily due to large increases in utility plant.

Taxes Still Soar . . . Taxes continue to be the largest expense in the income statement. In 1953 a record was set when they amounted to $1,338 million.

Gross Income Tops Old High . . . Gross income continued to increase in 1953, hitting $1,383 million as compared with $1,278 million in 1952. Other income totaled $151 million in 1953 as against $166 million in 1952. This decrease was due to less interest being received in 1953 on securities held by electric companies.

Capital Charges Up . . . Capital charges amounted to $338 million in 1953 as against $322 million in 1952. This increase was largely due to interest on funded debt because of the sale of nearly $1.2 billion of bonds and debentures to the public. Of this amount $973.1 million was sold publicly and over $217 million

Yields—Operating Electric Utilities



Yields on Electric Utility Operating Company Securities

	Bonds			Preferred Stocks			Common Stocks		
Quarter	First Quality	Second Quality	Third Quality	First Quality	Second Quality	Third Quality	First Quality	Second Quality	Third Quality
1948									
I	2.77	2.87	2.99	4.05	4.40	4.74	5.60	6.76	8.19
II	2.77	2.84	2.94	4.01	4.34	4.71	5.39	6.39	7.88
III	2.83	2.92	3.01	4.19	4.51	4.79	5.60	6.97	8.27
IV	2.76	2.83	3.03	4.10	4.37	4.81	6.01	7.34	8.53
1949									
I	2.70	2.78	2.92	4.00	4.27	4.67	5.78	6.69	8.08
II	2.69	2.75	2.88	3.98	4.26	4.66	5.94	6.96	8.14
III	2.61	2.65	2.77	3.88	4.15	4.54	5.55	6.47	75.1
IV	2.59	2.61	2.72	3.85	4.06	4.46	5.37	6.15	7.01
1950									
I	2.59	2.61	2.71	3.78	4.01	4.36	5.22	5.85	6.67
II	2.63	2.66	2.74	3.79	4.03	4.38	5.38	6.51	7.50
III	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.75
IV	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
1951									
I	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.16
II	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.37
III	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
IV	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
1952									
I	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47
II	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
III	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
IV	2.99	3.03	3.14	4.06	4.22	4.59	4.98	5.33	5.62
1953									
I	3.15	3.23	3.39	4.16	4.41	4.66	4.95	5.24	5.50
II	3.34	3.46	3.64	4.47	4.70	4.88	5.52	5.92	6.10
III	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.97	6.01
IV	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51

Source: Reis & Chandler, Inc.

Composite Year End Balance Sheet

Class A & B Electric Utility Companies

	Millions of Dollars			
	1953*	1952	1951	1943
Assets				
Electric Plant and Adjustments	25,700	22,967	20,622	11,831
Other Utility Plant and Adjustments	2,900	2,764	2,595	1,821
Unclassified and Undistributed	.....	.....	155	1,191
Total Utility Plant	28,600	25,731	23,372	14,843
Reserves for Depreciationend Amortization of Utility Plant	5,600	5,105	4,734	2,557
Total Utility Plant Less Reserves	23,000	20,626	18,638	12,286
Investment and Fund Accounts	1,260	1,255	1,235	1,290
Current and Accrued Assets	2,590	2,443	2,308	1,583
Deferred Debits	170	179	184	334
Capital Stock Discount and Expenses	50	49	46	32
Reacquired Securities	30	29	27	55
Total Assets	27,100	24,581	22,438	15,580
Liabilities				
Capital Stock				
Preferred	3,125	2,897	2,731	2,143
Common	6,400	5,867	5,409	4,210
Premium on Capital Stock	600	465	399	109
Total Capital Stock	10,125	9,229	8,539	6,462
Long Term Debt				
Bonds	11,550	10,369	9,367	6,587
Other	450	440	627	.....
Total Long Term Debt	12,000	10,809	9,994	6,587
Current and Accrued Liabilities	2,250	2,090	1,857	987
Reserves (except those deducted above)	80	79	81	300
Deferred Credits	130	128	126	94
Contributions in Aid of Construction	90	78	70	53
Surplus				
Earned	1,900	1,645	1,445	845
Capital	525	523	326	252
Total Surplus	2,425	2,168	1,771	1,097
Total Liabilities	27,100	24,581	22,438	15,580
Balance Sheet Ratios				
Reserve for Depreciation Percent of Utility Plant	19.6	19.8	20.3	17.2
Current Assets Times Current Liabilities	1.15	1.17	1.24	1.60
Long Term Debt				
Percent of Gross Utility Plant	41.9	42.0	42.8	44.4
Percent of Net Utility Plant	52.2	52.4	53.6	53.6

Source: Federal Power Commission. * 1953 estimated by "Electrical World."

placed privately with institutional investors. Capital charges have gone from 10.9¢ of every dollar of revenue in 1943 to a record low of 5.5¢ in 1953.

Net Income Over $1 Billion Mark . . . Net income amounted to $1,045 million in 1953 as against $956 million in 1952. This record established in 1953 was over twice the net income reported for 1943.

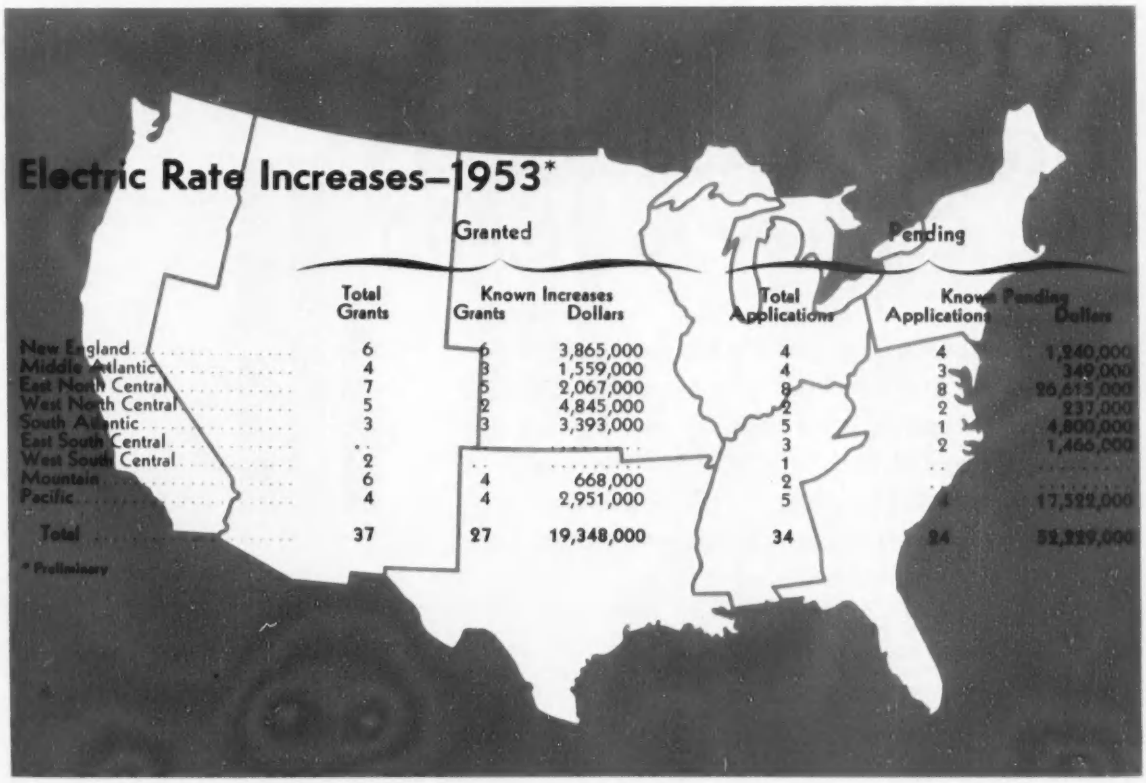
Dividends Higher . . . Preferred dividends increased to $138 million in 1953 due to the sale of over $226 million in preferred stock, including $700,000 for refunding purposes. Common dividends amounted to $650 million, an increase of $48 million over the previous year. This record payment was due to electric companies paying extras or raising their dividend payments.

Balance to Surplus Up . . . The income transferred to surplus in 1953 totaled $257 million as compared with a former record high of $224 million in 1952. This is almost three times the 1943 figure when only $94 million was transferred.

Total Assets at Record . . . Total assets of the Class A&B electric utility companies amounted to an estimated $27.1 billion at Dec. 31, 1953. This is nearly a $5 billion increase since 1951.

Security Sales Mount . . . The financing by electric companies as reported by the Irving Trust Co amounted to $1,956 million in 1953, an increase of 14.7% over 1952. This surpassed the record year of 1949 when these companies sold $1,793 million of securities. Of the 1953 total, bonds and debentures accounted for $1,190 million of which $217 million was sold privately to institutions. Total common and preferred stock sales amounted to $766.6 million of which common stock was $540 million a new record. This latter figure nearly matches all bonds and debentures sold publicly and privately in 1937. When the interest rates were the highest since the middle thirties, the electric companies in the second quarter of 1953 sold a record $343.8 million in "new money" debt as against the former high of $341.8 million sold in the same quarter of 1952.

Yields Irregular . . . Yields on electric company securities rose and fell erratically during 1953. In the first quarter of 1953 first quality yields were around 3.15% leaping to 3.34% in the second quarter, the highest since the middle thirties and going down to a low of 3.07% by the end of the fourth quarter. Preferred stocks showed the same pattern on all qualities. Common stock likewise was erratic in 1953. For the first time since the Reis & Chandler yield chart began in 1946 the yields of third quality common stock went below the yield of second quality. At year-end the yield on second quality common stocks went to 5.57%, while third quality common stocks stood at 5.51%.


Electric Rate Increases–1953*
Granted
Pending
Total Grants
Known Increases Grants
Known Increases Dollars
Total Applications
Known Pending Applications
Known Pending Dollars
New England 6 6 3,865,000 4 4 1,240,000
Middle Atlantic 4 3 1,559,000 4 3 349,000
East North Central 7 5 2,067,000 8 8 26,615,000
West North Central 5 2 4,845,000 2 2 237,000
South Atlantic 3 3 3,393,000 5 1 4,800,000
East South Central 3 2 1,466,000
West South Central 2 .. .. 1 .. ..
Mountain 6 4 668,000 2 .. ..
Pacific 4 4 2,951,000 5 4 17,522,000
Total 37 27 19,348,000 34 24 52,229,000
* Preliminary

Rate Increase Grants Are Much Less

Electric companies were granted only 37 rate increases in 1953 as compared with 78 in 1952. The known dollar increases of 27 of the 37 granted totaled over $19 million in 1953. This compared with $76.7 million in 1952.

Union Electric Co of Missouri received the largest increase in 1953, amounting to $4.4 million. The known dollars pending in 24 applications before commissions totaled over $52 million at the year end, the largest being the $16,450,000 increase for Commonwealth Edison Co and the $16 million for Southern California Edison Co.

Electric Rate Increases

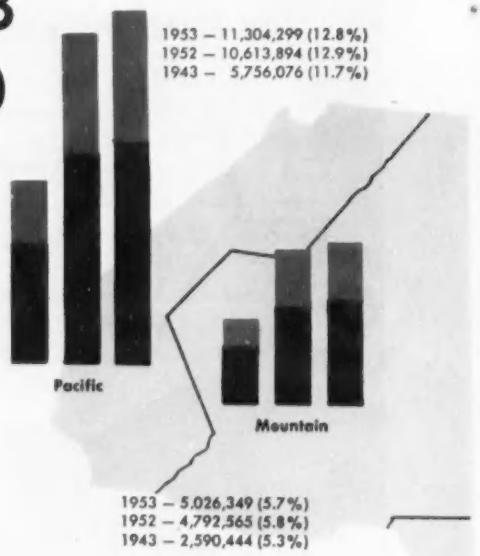
	Granted				Pending		
	Number of Grants	Known Increases Grants	Known Increases Dollars	As of December 31	Number of Applications	Known Pending Applications	Known Pending Dollars
1948	81	45	39,000,000	1948	18	11	22,000,000
1949	74	44	35,000,000	1949	7	5	16,000,000
1950	19	10	14,000,000	1950	21	14	20,200,000
1951	44	27	32,900,000	1951	44	32	75,700,000
1952	78	57	76,700,000	1952	36	21	44,400,000
1953*	37	27	19,348,000	1953*	34	24	52,229,000

* Preliminary

CAPACITY

8,674 Mw Added in '53 Ups Capacity to 90,900

A probable increase of 8,674 Mw during 1953 will mark the biggest annual gain on record. On Nov. 1 total capacity stood at 88,816 Mw, already topping the end of 1952 by 6,392 Mw. Estimated 1953 total is 90,900 Mw. That's a 10.5% gain over 1952, with fuel power increases adding major share.



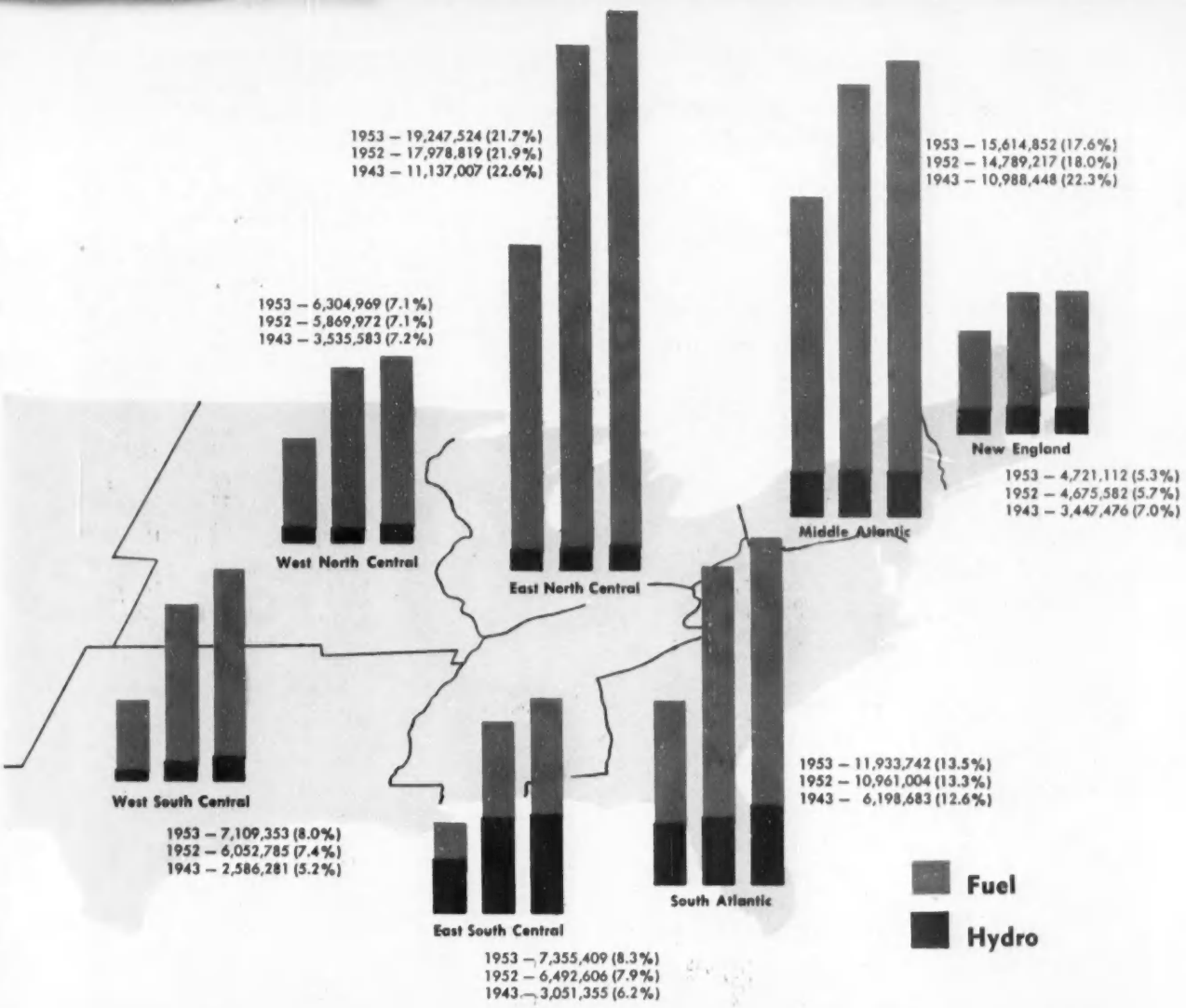
Generating Capacity—Kw and % Total U. S.

Source: Federal Power Commission. Data for 1953 as of November 1. All bars from left to right: 1943, 1952, 1953

Installed Capacity by Type of Prime Mover—Mw

	Fuel				Hydro				Total		
	Capacity	% Total	Annual Change		Capacity	% Total	Annual Change		Capacity	Annual Change	
1937	25,444	71.4			10,176	28.6			35,620		
1938	26,835	71.6	1,391	(5.5%)	10,657	28.4	481	(4.7%)	37,492	1,872	(5.3%)
1939	27,859	71.7	1,024	(3.8%)	11,004	28.3	347	(3.3%)	38,863	1,371	(3.7%)
1940	28,703	71.9	844	(3.0%)	11,224	28.1	220	(2.0%)	39,927	1,064	(2.7%)
1941	30,588	72.1	1,885	(6.6%)	11,817	27.9	593	(5.3%)	42,405	2,478	(6.2%)
1942	32,211	71.5	1,623	(5.3%)	12,842	28.5	1,025	(8.7%)	45,053	2,648	(6.2%)
1943	34,068	71.0	1,857	(5.8%)	13,883	29.0	1,041	(8.1%)	47,951	2,898	(6.4%)
1944	34,603	70.3	535	(1.6%)	14,586	29.7	703	(5.1%)	49,189	1,238	(2.6%)
1945	35,199	70.2	596	(1.7%)	14,912	29.8	326	(2.2%)	50,111	922	(1.9%)
1946	35,468	70.5	269	(0.8%)	14,849	29.5	−63		50,317	206	(0.4%)
1947	37,351	71.4	1,883	(5.3%)	14,971	28.6	122	(0.8%)	52,322	2,005	(4.0%)
1948	40,908	72.3	3,557	(9.5%)	15,652	27.7	681	(4.5%)	56,560	4,238	(8.1%)
1949	46,446	73.6	5,538	(13.5%)	16,654	26.4	1,002	(6.4%)	63,100	6,540	(11.6%)
1950	51,244	74.4	4,798	(10.3%)	17,675	25.6	1,021	(6.1%)	68,919	5,819	(9.2%)
1951	56,907	75.1	5,663	(11.1%)	18,868	24.9	1,193	(6.7%)	75,775	6,856	(9.9%)
1952	61,807	75.1	4,900	(8.6%)	20,419	24.9	1,551	(8.2%)	82,226	6,451	(8.5%)
Nov. 1, 1953	66,969	75.6			21,649	24.4			88,618		
1953†	69,095	76.0	7,288	(11.8%)	21,805	24.0	1,386	(6.8%)	90,900	8,674	(10.5%)

Source: Federal Power Commission. †Estimated by Electrical World.



Generating Capacity by Ownership—Mw

	Power Companies		Federal		Municipal, State and Power District		Cooperatives	
	Capacity	% Total	Capacity	% Total	Capacity	% Total	Capacity	% Total
1937	31,959	89.7	832	2.3	2,829†	8.0	...	...
1938	33,246	88.7	1,156	3.1	3,090†	8.2	...	...
1939	33,908	87.3	1,650	4.2	3,305†	8.5	...	...
1940	34,398	86.2	1,944	4.9	3,585†	8.9	...	...
1941	36,041	85.0	2,371	5.6	3,993†	9.4	...	...
1942	37,442	83.1	3,216	7.1	4,395†	9.8	...	...
1943	39,128	81.6	4,322	9.0	4,501†	9.4	...	...
1944	39,733	80.8	4,886	9.9	4,570†	9.3	...	...
1945	40,307	80.4	5,081	10.2	4,723†	9.4	...	...
1946	40,335	80.2	4,920	9.8	5,062†	10.0	...	...
1947	41,987	80.2	5,027	9.6	5,141	9.9	167	0.3
1948	45,381	80.2	5,526	9.8	5,453	9.6	200	0.4
1949	50,484	80.0	6,210	9.8	6,168	9.8	238	0.4
1950	55,175	80.1	6,921	10.0	6,511	9.4	312	0.5
1951	60,192	79.4	8,099	10.7	6,993	9.2	491	0.6
1952	64,349	78.4	9,678	11.8	7,671	9.3	528	0.6
Nov. 1, 1953	68,832	77.7	11,000	12.4	8,169‡	9.2	616‡	0.7

Source: Federal Power Commission. †Includes Cooperatives. 1940 and after excludes publicly owned transit systems. ‡Estimated by Electrical World.

Number and Installed Capacity of Electric Utility Generating Plants By States and Type of Prime Mover—Kilowatts

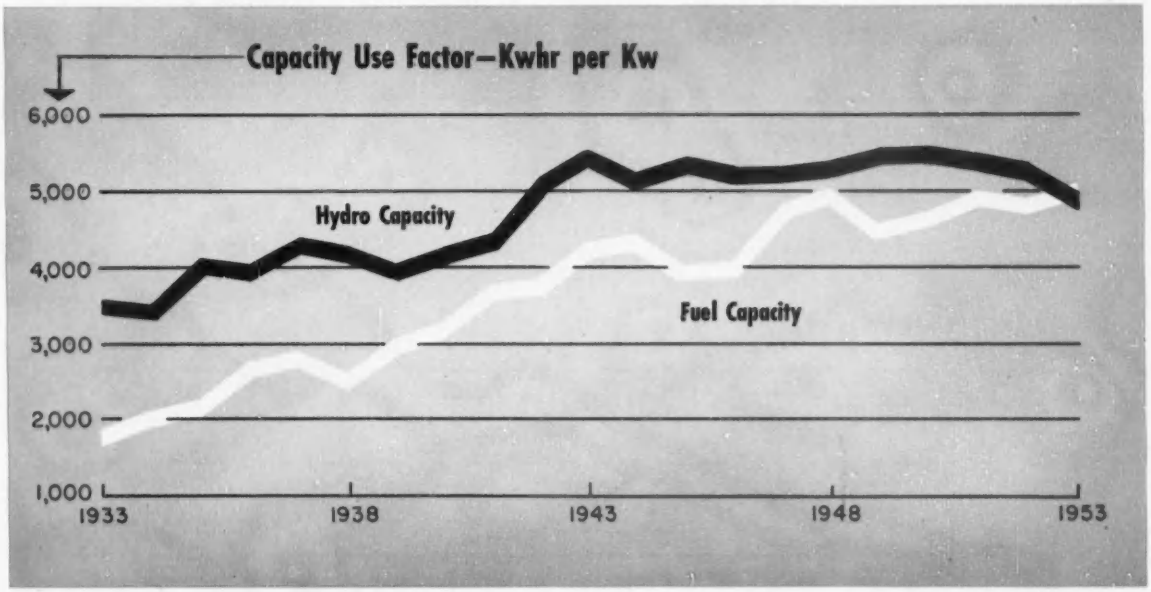
November 1, 1953

	Number of Utilities[a]	Number of Plants[b]	Total Capacity	Generator Capacity in Kilowatts of Plants Operated by[b]					
				Water Power		Steam Power		Internal Combustion Engines	
				Number	Capacity	Number	Capacity	Number	Capacity
UNITED STATES	**1,469**	**3,691**	**88,617,609**	**1,410**	**21,649,117**	**1,040**	**64,805,751**	**1,241**	**2,162,741**
New England	**96**	**315**	**4,721,112**	**210**	**996,731**	**70**	**3,647,820**	**35**	**76,561**
Maine	18	82	476,535	57	268,608	8	181,500	17	26,427
New Hampshire	11	49	437,474	42	262,184	6	173,250	1	2,040
Vermont	17	75	220,897	60	184,302	8	24,750	7	11,845
Massachusetts	34	71	2,093,124	33	182,292	31	1,887,130	7	23,702
Rhode Island	6	10	360,622	3	2,875	5	352,200	2	5,547
Connecticut	10	28	1,132,460	15	96,470	12	1,028,990	1	7,000
Middle Atlantic	**90**	**315**	**15,614,852**	**166**	**1,626,142**	**124**	**13,930,952**	**25**	**57,758**
New York	45	206	7,282,653	146	1,181,482	45	6,061,895	15	39,276
New Jersey	10	20	2,398,356	3	6,350	15	2,389,024	2	2,982
Pennsylvania	35	89	5,933,843	17	438,310	64	5,480,033	8	15,500
East North Central	**278**	**647**	**19,247,524**	**272**	**868,208**	**228**	**18,055,663**	**147**	**323,553**
Ohio	53	90	5,223,557	5	10,525	66	5,178,050	19	34,982
Indiana	41	67	2,688,363	14	35,170	37	2,607,480	16	45,713
Illinois	55	98	5,413,762	10	47,909	60	5,298,208	28	67,645
Michigan	63	197	3,797,572	119	407,028	35	3,269,725	43	120,819
Wisconsin	66	195	2,124,270	124	367,676	30	1,702,200	41	54,394
West North Central	**457**	**882**	**6,304,969**	**117**	**630,775**	**217**	**4,783,458**	**548**	**890,736**
Minnesota	81	175	1,469,385	39	144,371	52	1,160,967	84	164,047
Iowa	94	202	1,315,136	29	140,121	48	935,991	125	239,024
Missouri	71	118	1,430,440	7	194,073	33	1,106,665	78	129,702
North Dakota	15	45	235,112	...	.....	18	198,040	27	37,072
South Dakota	35	68	199,957	6	4,621	10	126,250	52	69,086
Nebraska	75	144	672,497	31	141,404	21	430,445	92	100,648
Kansas	86	130	982,442	5	6,185	35	825,100	90	151,157
South Atlantic	**132**	**385**	**11,933,742**	**164**	**2,714,846**	**127**	**9,058,725**	**94**	**160,171**
Delaware	5	7	149,588	...	.....	5	143,150	2	6,438
Maryland	11	23	1,370,117	3	271,325	12	1,085,000	8	13,792
District of Columbia	2	3	533,000	1	3,000	2	530,000	...	.....
Virginia	22	74	1,643,794	40	368,578	17	1,255,124	17	20,092
West Virginia	11	34	1,892,791	10	100,880	17	1,787,915	7	3,996
North Carolina	28	83	2,298,524	50	668,055	19	1,602,846	14	27,623
South Carolina	12	41	1,264,459	28	813,445	9	449,000	4	2,014
Georgia	10	43	1,361,822	28	476,902	12	882,000	3	2,920
Florida	31	77	1,419,647	4	12,661	34	1,323,690	39	83,296
East South Central	**48**	**118**	**7,255,409**	**29**	**3,488,080**	**49**	**3,839,910**	**30**	**27,419**
Kentucky	12	29	1,727,054	5	540,860	21	1,178,925	3	7,269
Tennessee	10	36	2,763,613	22	1,656,000	10	1,103,000	4	4,613
Alabama	4	22	2,443,620	12	1,291,220	7	1,150,000	3	2,400
Mississippi	22	31	421,122	...	.....	11	407,985	20	13,137
West South Central	**160**	**354**	**7,109,353**	**35**	**804,924**	**105**	**5,933,685**	**214**	**370,744**
Arkansas	18	33	851,150	7	313,340	12	507,895	14	29,915
Louisiana	30	62	1,248,357	...	.....	16	1,172,850	46	75,507
Oklahoma	43	74	1,040,979	4	132,124	22	839,040	48	76,815
Texas	69	185	3,968,867	24	359,460	55	3,420,900	106	188,507
Mountain	**130**	**383**	**5,026,349**	**190**	**3,417,269**	**70**	**1,408,983**	**123**	**200,097**
Montana	10	28	819,644	18	744,970	5	71,968	5	2,706
Idaho	13	51	741,084	43	736,180	1	400	7	4,504
Wyoming	23	49	188,421	18	107,397	11	69,320	20	11,704
Colorado	39	77	644,651	26	143,397	24	467,873	27	33,381
New Mexico	18	35	353,142	4	24,910	13	283,972	18	44,260
Arizona	15	45	1,325,386	13	980,080	10	277,950	22	67,356
Utah	25	82	358,133	59	94,155	6	237,500	17	26,478
Nevada	7	16	595,888	9	586,180	...	.....	7	9,708
Pacific	**58**	**292**	**11,304,299**	**217**	**7,102,042**	**50**	**4,146,555**	**25**	**55,702**
Washington	20	56	3,611,962	41	3,411,036	8	196,820	7	4,106
Oregon	18	69	1,039,899	50	834,719	12	198,710	7	6,470
California	20	167	6,652,438	126	2,856,287	30	3,751,025	11	45,126

Source: Federal Power Commission

[a] Total includes 93 duplications because of utilities having generating plants in more than one state.

[b] Each type of prime mover at combination plants is counted as a separate plant.



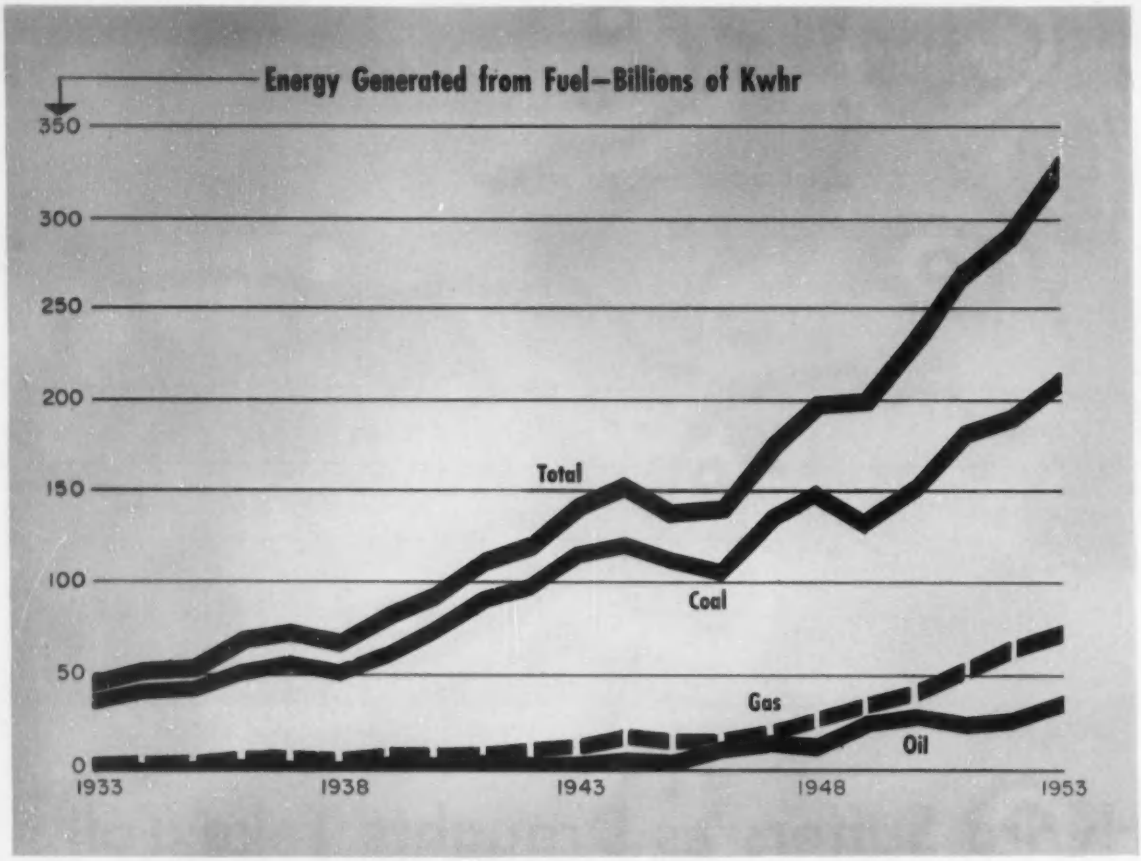
Hydro Suffers as Droughts Take Toll

Use factor falls below fuel for the first time on record. Coal, oil, and gas consumption at new levels. Coal rate is down to 1.07 lb per kwhr

Production, Capacity, Average Use

	Production Millions of Kwhr			Year End Capacity Thousands of Kw			Kwhr per Kw of Average Capacity		
	Fuel	Hydro	Total	Fuel	Hydro	Total	Fuel	Hydro	Total
1937	74,900	44,013	118,913	25,444	10,176	35,620	2,967	4,355	3,364
1938	69,533	44,279	113,812	26,335	10,657	37,492	2,661	4,251	3,113
1939	84,078	43,564	127,642	27,859	11,004	38,863	3,074	4,022	3,343
1940	94,516	47,321	141,837	28,703	11,224	39,927	3,342	4,258	3,600
1941	113,925	50,863	164,788	30,588	11,817	42,405	3,843	4,415	4,003
1942	122,109	63,871	185,979	32,211	12,842	45,053	3,889	5,180	4,253
1943	144,127	73,632	217,759	34,067	13,884	47,951	4,349	5,510	4,683
1944	154,244	73,945	228,189	34,603	14,586	49,189	4,492	5,195	4,698
1945	142,516	79,970	222,486	35,199	14,912	50,111	4,078	5,422	4,481
1946	144,772	78,406	223,178	35,468	14,849	50,317	4,097	5,269	4,445
1947	177,313	78,426	255,739	37,351	14,971	52,322	4,870	5,260	4,983
1948	200,228	82,470	282,698	40,908	15,652	56,560	5,052	5,386	5,193
1949	201,351	89,748	291,099	46,446	16,654	63,100	4,610	5,561	4,865
1950	233,203	95,938	329,141	51,244	17,675	68,919	4,774	5,589	4,986
1951	270,922	99,751	370,673	56,907	18,868	75,775	5,010	5,460	5,123
1952	294,121	105,102	399,224	61,807	20,419	82,226	4,955	5,350	5,054
1953*	336,959	105,055	442,014	69,095	21,805	90,900	5,148	4,976	5,106

Source: Federal Power Commission. *1953 data estimated. 1945 and after excludes former Mining and Manufacturing and Railroad and Railway classifications.



Coal consumption was a record 116 million tons in 1953, 9 million more than 1952. Oil and gas continued to demonstrate tremendous growth. Usage of each has about doubled in the last five years to total 84 million bbl of oil, 1,010 billion cu ft of gas at the end of 1953.

Consumption of Coal, Oil and Gas

	Energy Generated From Coal, Oil, and Gas				Coal, Oil, and Gas Consumed				Coal Rate
	Coal Billions of Kwhr	Oil Billions of Kwhr	Gas Billions of Kwhr	Total Billions of Kwhr	Coal Millions of Tons	Oil Millions of Bbls	Gas Billions of Cu Ft	Coal and Equivalent of Oil and Gas Millions of Tons	Pounds per Kwhr
1939	64.7	7.3	11.6	83.6	44.54	17.14	188.88	57.60	1.38
1940	76.8	6.2	10.9	94.0	51.47	16.33	180.10	62.94	1.34
1941	93.8	7.5	12.0	113.3	62.67	20.08	201.76	75.70	1.34
1942	101.9	5.6	14.1	121.6	66.26	15.24	235.21	79.08	1.30
1943	119.2	6.8	17.8	143.8	77.30	17.99	301.94	93.27	1.30
1944	124.1	8.1	21.6	153.9	80.08	20.86	358.78	99.25	1.29
1945	114.8	7.8	19.7	142.3	74.72	20.23	326.21	92.64	1.30
1946	111.7	14.1	18.8	144.6	72.20	36.32	306.94	93.47	1.29
1947	137.0	16.9	23.1	177.0	89.53	45.31	373.05	115.67	1.31
1948	152.9	16.8	30.1	199.8	99.59	42.64	478.10	130.12	1.30
1949	135.5	28.5	37.0	201.0	83.96	66.30	550.12	124.57	1.24
1950	154.5	33.7	44.6	232.8	91.87	75.42	628.92	138.42	1.19
1951	185.2	28.7	56.6	270.5	105.77	63.94	763.90	154.50	1.14
1952	195.4	29.7	68.5	293.6	107.07	67.22	910.12	160.87	1.10
1953*	216.0‡	38.9‡	77.6‡	332.9†	115.56	84.15	1,009.54	177.96	1.07

Source: Federal Power Commission. * Twelve months ended November 1. † Small amoun tof energy generated from wood included in 1953. ‡ Preliminary.

Analysis of Fuel Burned Under Boilers and by Internal Combustion Engines for Generation of Electricity

		Average Btu per Net Kwhr	Average Cost per Million Btu Consumed ¢	Average Cost of Fuel per Net Kwhr ¢	% Net Generation Reported	Average Cost per Million Btu Consumed—Cents: Coal[a]	Oil[b]	Gas[c]	Coal[a]: Average Cost $ per Ton	Coal[a]: Average Btu Content per Pound	Oil[b]: Average Cost $ per Bbl	Oil[b]: Average Btu Content per Gallon	Gas[c]: Average Cost $ per M cu ft	Gas[c]: Average Btu Content per cu ft
United States	1952	13,366	25.0	0.33	94.1	27.1	33.8	15.3	6.52	12,039	2.14	150,439	0.147	965
	1951	13,641	24.9	0.34	94.4	26.8	33.6	14.1	6.42	11,968	2.11	150,137	0.136	972
	1950	14,030	24.8	0.35	93.6	26.9	31.8	12.3	6.38	11,839	2.00	149,699	0.118	960
	1949	15,033	25.2	0.38	91.8	27.1	34.2	11.8	6.50	12,011	2.15	149,843	0.123	1,046
	1948	15,738	26.7	0.42	82.3	27.9	45.3	10.5	6.69	11,980	2.81	147,653	0.110	1,053
New England	1952	13,543	36.7	0.50	98.2	37.3[e]	35.9	36.9	10.20[e]	13,694	2.26	150,000	0.376	1,020
	1951	13,970	35.8	0.50	95.6	36.0[e]	35.5	——	9.93[e]	13,775	2.24	150,227	——	——
	1950	14,473	34.3	0.50	95.7	36.0[e]	32.9	——	9.89[e]	13,728	2.08	150,486	——	——
	1949	15,422	36.1	0.56	96.5	39.4	32.6	——	10.87	13,784	2.07	150,984	——	——
Middle Atlantic	1952	13,748	29.5	0.41	98.6	28.9	35.5	26.5	7.44	12,879	2.24	150,138	0.279	1,053
	1951	13,964	29.0	0.40	98.7	28.3	35.9	26.3	7.20	12,759	2.26	149,962	0.274	1,052
	1950	14,315	28.5	0.41	98.3	27.4	32.3	26.0	6.90	12,604	2.03	149,790	0.258	991
	1949	14,950	28.5	0.43	98.0	28.2	30.4	19.9	7.19	12,768	1.92	150,345	0.188	945
East North Central	1952	12,899	25.2	0.32	95.9	25.7	70.5	19.3	5.97	11,603	4.22	142,458	0.168	867
	1951	13,123	25.6	0.34	95.4	25.7	72.6	20.2	5.90	11,484	4.40	144,445	0.121	601
	1950	13,462	26.4	0.36	95.3	26.4	59.0	18.2	6.03	11,415	3.58	144,564	0.108	594
	1949	14,329	24.9	0.36	89.7	25.0	47.0	16.3	5.81	11,619	2.85	144,416	0.160	984
West North Central	1952	15,854	24.5	0.39	74.3	28.4	47.5	19.0	5.68	9,994	2.96	148,097	0.138	726
	1951	16,198	24.6	0.40	71.5	28.4	53.7	17.3	5.61	9,891	3.29	146,073	0.134	774
	1950	16,659	24.0	0.40	70.3	29.1	51.8	15.0	5.77	9,908	3.14	144,399	0.117	782
	1949	18,441	27.7	0.51	72.0	28.0	70.0	15.4	5.69	10,167	4.21	143,277	0.155	1,005
South Atlantic	1952	12,546	27.3	0.34	95.6	27.2	33.6	18.8	7.00	12,841	2.12	150,603	0.192	1,021
	1951	12,978	26.8	0.35	96.5	26.7	33.7	18.3	6.86	12,862	2.12	149,815	0.188	1,023
	1950	13,295	26.4	0.35	95.7	26.5	31.2	15.2	6.76	12,747	1.96	149,779	0.155	1,023
	1949	13,640	27.4	0.37	96.3	27.8	31.4	15.2	7.17	12,882	1.98	150,214	0.156	1,023
East South Central	1952	12,543	18.5	0.23	97.7	20.1	45.9	14.6	4.76	11,863	2.87	148,814	0.152	1,039
	1951	13,560	18.3	0.25	96.8	20.2	44.0	13.9	4.78	11,856	2.75	148,815	0.144	1,035
	1950	13,472	19.1	0.26	95.6	21.7	43.0	13.8	5.10	11,771	2.69	148,814	0.141	1,025
	1949	13,736	25.0	0.34	90.4	23.5	74.7	13.3	5.56	11,839	4.39	140,000	0.138	1,036
West South Central	1952	13,706	9.1	0.12	87.2	18.9	44.3	8.9	4.39	11,618	2.72	146,151	0.094	1,053
	1951	14,017	8.5	0.11	91.9	19.6	40.9	8.3	4.51	11,496	2.54	147,771	0.088	1,057
	1950	14,739	7.7	0.11	89.0	18.7	25.0	7.5	4.49	12,024	1.55	147,662	0.080	1,063
	1949	16,833	7.9	0.13	91.7	19.3	32.2	7.6	4.60	11,892	1.99	146,956	0.081	1,068
Mountain	1952	15,008	18.8	0.28	88.0	21.1	26.6	16.6	3.71	8,791	1.68	150,233	0.160	966
	1951	15,063	18.8	0.28	87.6	22.7	38.0	16.4	4.67	10,274	2.35	147,628	0.159	969
	1950	16,013	18.1	0.29	85.9	22.6	42.8	15.7	4.63	10,246	2.63	146,143	0.152	967
	1949	17,584	19.3	0.34	75.6	23.1	51.3	15.2	4.89	10,592	3.15	146,269	0.150	986
Pacific	1952	14,218	25.3	0.36	96.2	12.4[d]	28.7	23.1	0.76[d]	3,069[d]	1.82	151,547	0.251	1,086
	1951	13,385	23.4	0.31	96.1	11.3[d]	26.7	20.8	0.70[d]	3,114[d]	1.69	151,047	0.226	1,089
	1950	13,920	19.9	0.28	96.2	10.7[d]	21.5	19.6	0.70[d]	3,259[d]	1.35	149,799	0.213	1,084
	1949	16,080	25.0	0.40	93.0	14.1[d]	29.8	19.7	1.08[d]	3,818[d]	1.88	150,010	0.212	1,077

Source: Edison Electric Institute

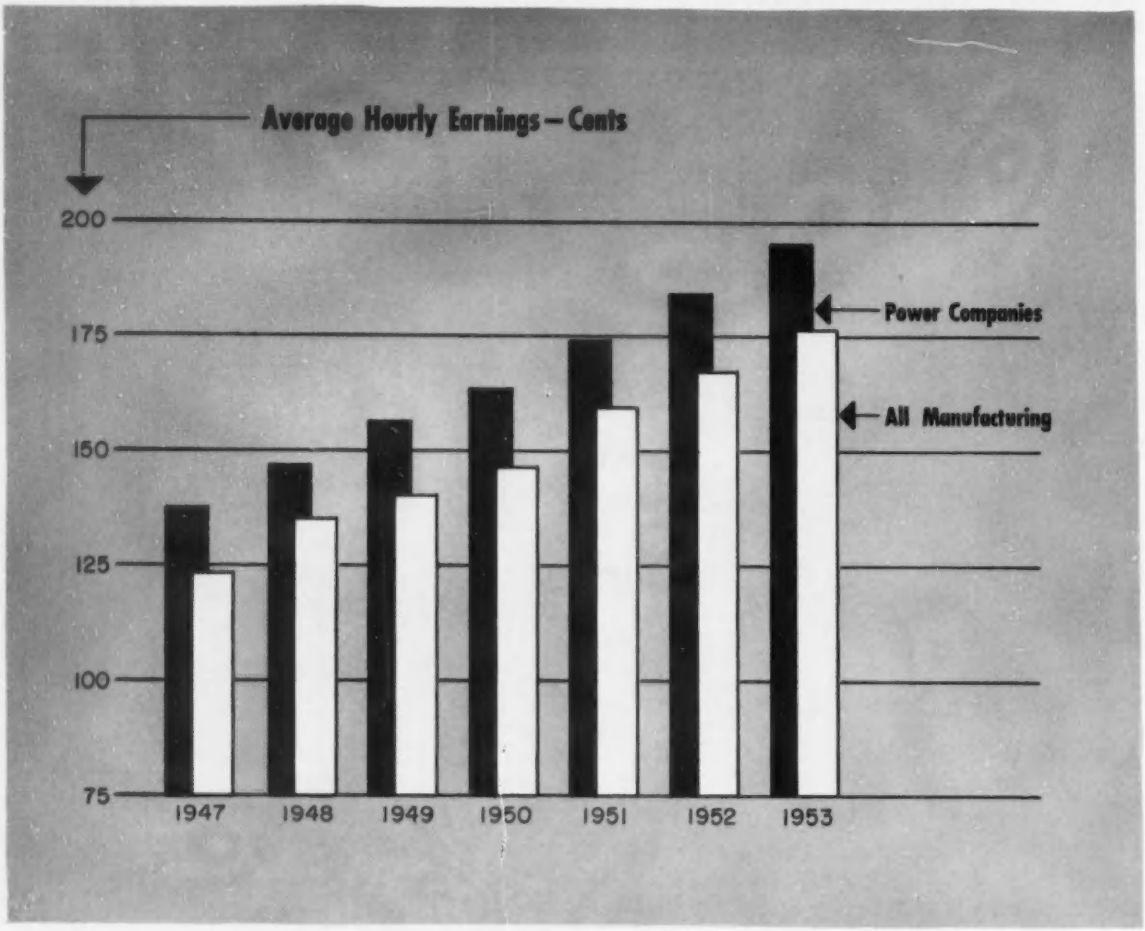
[a] Coal includes bituminous and anthracite coal, and relatively small amounts of coke, lignite and wood.

[b] Oil includes fuel oil, crude oil, and small amounts of tar and gasoline.

[c] Gas includes natural and manufactured gas and waste gas.

[d] Cords and cubic feet of hogged wood converted to pounds and tons.

[e] Includes bbl. of oil converted to equivalent tons of coal.



Wages, Employment Hit New Highs

Wages—Hours Worked by Electric Utility Employees

	Average Hourly Earnings (Cents)	Average Weekly Earnings (Dollars)	Average Weekly Hours	Estimated Number of Employees* (Thousands)
1947.....	137.1	57.44	41.9	213.0
1948.....	146.9	61.70	42.0	227.4
1949.....	156.4	64.91	41.5	236.4
1950.....	163.0	67.81	41.6	238.9
1951.....	174.0	72.91	41.9	240.4
1952.....	184.0	76.18	41.4	243.5
1953‡.....	195.0	80.62	41.4	246.7

Source: Bureau of Labor Statistics. * Covers employees in the electrical divisions of power companies. ‡ Averages of monthly data for first nine months.

Salaries and wages and employment in the electric power industry went into new high grounds in 1953. The average hourly earnings for the electric worker amounted to $1.95 in 1953 as compared with $1.84 in 1952.

The electric worker earned an average of $80.62 a week in 1953 as against $76.18 a week in 1952. This weekly pay is based on a 41.4 hour work week for both years. The average pay is some 10% more than the average worker in the manufacturing industry received.

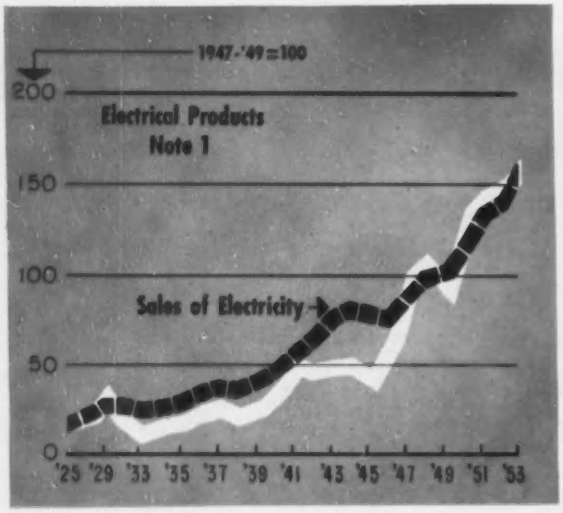
Employees in the electrical division of power companies totaled a record high of 246,700 at the end of 1953, an increase of 3,200 over a year ago. Since 1947 there were over 33,000 new employees added by these companies. This is an increase of 15.8%.

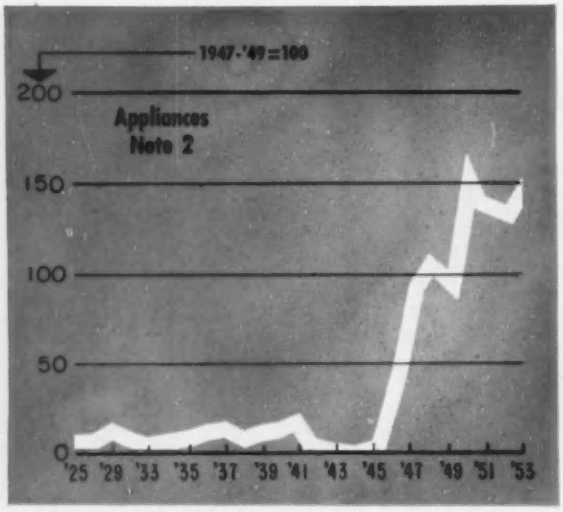
Labor Contracts and Terms—1953

Company	Union	Date	Workers Covered	Wage Increase, Other Benefits
Alabama Power	IBEW	3/ 1/53	2,500	5½% applied to the top of all wage schedules, resulting dollar amounts to be added to intermediate steps in each classification; 7th paid holiday
Appalachian Electric Power	IBEW	4/ 1/53	3,450	5%; elimination of wage diff. between Va. and West Va.; some ineq. adjustments; one additional pd hol.
Arizona Public Service	IBEW	3/26/53	800	5% (5¢-14¢)
Boston Edison (prod. and maint. empls)	UWU	1/ 1/53	2,000	12½¢, 20% prem. pay for scheduled Sun. work; 1 addl. day of vac. for ea. yr. of service after 10 yrs. up to max. 3 wks after 15 yrs; impr. call-out pay and other impr.
Boston Edison (office and clerical empls)	UWU	1/ 1/53	1,000	12½¢; one addl. day of vac. for ea. yr. of service after 10 yrs. up to max. 3 wks after 15 yrs.
Central Maine Power	IBEW	5/ 1/53	1,000	6½%; 9 pd. hols. guar. (prev. no guar.); up to 3 days funeral leave; co-pd hosp. and surg. ben.
Central Vermont Public Service	IBEW UMW-50	1/ 1/53	550	6%; 2 wks inc. in standby pay; co. to pay ½ cost of hosp. ins.
Cincinnati Gas & Electric	IBEW	4/ 1/53	1,500	8¢-20¢
Cleveland Electric Illuminating	UWU	4/ 1/53	4,800	8¢ plus a sum for reclassif. of specific jobs; 6¢ and 11¢ shift diff. (were 4¢ and 6¢); time and ½ for regularly sched. Sun. work (was straight time) and 15¢ hr. prem. on Sun—emplys. working rotating shift; double time and ½ for hol. work (was double time); 11¢ "plug"
Columbus & Southern Ohio Electric	IBEW	3/ 1/53	1,200	10% (12¢-23¢)
Commonwealth Edison	IBEW	4/ 1/53	12,200	10¢ hr inc. in base rates; some ineq. adjust; 2¢ hr. red. in zone differentials; 6 mos. shortening of progression schedules
Connecticut Power	IBEW	5/ 1/53	1,000	8¢; some addit adjust in key job classif.; co-pd. hosp. ins. for empls. and dependents (was contributory)
Consolidated Edison System	UWU	1/ 4/53	25,000	8¢; cont. of prog. plan with elig. empls. rec. addl. 5¢ eff. 1/4/53 and addl. 5¢ eff. 7/5/53; addl. 5¢ inc. for empl. with 5 yrs. service and not yet at max; inc. mins.; liberalized optional retirement at age 50 after 30 years (was age 55 after 35 yrs) and new provision granting widows a survivorship ben. equal to ½ the amt. empls. would rec. had he retired when eligible provided his age and yrs service equal 80 yrs; co agrees to fund pension plan at rate of $3 million yearly in addition to meeting current costs, subject to govt approval
Consumers Power	UWU	3/ 1/53	4,700	10¢; 6¢ shift diff. (was 4¢ rotating shift empls. and 9¢ irregularly sched. empls; guar. pay for 6 hols. regardless of day of wk they fell; impr. sick lv. provisions, expense allow. and funeral lv.
Cowlitz County, Wash., PUD	IBEW	1/ 1/53	200	6%
Detroit Edison	UWU	6/ 1/53	4,500	4% plus 8¢ of present 13¢ automatic C-of-L adjust. incorp. into base rates; escal. clause converted to "revised" BLS-CPI thus avoiding a 2¢ decrease due under the old clause.
Florida Power Corp and sub, Georgia Power & Light	IBEW	7/23/53	.....	5½% increase for approx. 975 union empls. with comparable increase to 795 other empls.
Florida Power & Light	IBEW	4/27/53	2,900	5½%; revised retirement ben. and other impr.
Georgia Power	IBEW	.....	2,500	5½%
Georgia Power (non-union office sales and other empls.)	None	3/ 1/53	2,000	5½%
Interstate Power, Minn.	IBEW	4/ 1/53	900	6% addl. 2% eff. 10/1/53; supplementary jury duty pay
Iowa Public Service	Various	.....	1,400	8¢
Kansas City Power & Light	IBEW	4/ 1/53	1,300	13½¢ of which 11½¢ retroactive to 7/1/52; 1¢ shift diff.; 8 pd hols.
Kansas City Power & Light	IBEW	7/1/ 53	1,300	10¢ nego. under wage reop.
Long Island Lighting	IBEW	5/ 1/53	1,400	5%
Niagara Mohawk Power	IBEW	5/31/53	7,000	5% nego. under wage reop. clause
Ohio Edison	UWU	7/ 1/53	2,200	5½%
Ohio Power (Central Div. and Phila. Tidd and Windsor Plants)	UWU	.....	975	4½%; 6¢ and 9¢ shift diff. (were 4¢ and 6¢); 7 pd hols.
Pacific Gas & Electric	IBEW	9/ 1/53	14,600	average 7¢; upward revision for 61 classif.; impr. pens. plan
Pacific Power & Light	IBEW	4/ 1/53	950	6%
Pennsylvania Electric	IBEW	5/26/53	1,550	approx. 5%
Pennsylvania Power & Light	Indep.	6/ 1/53	4,800	8¢; co-pd Blue Cross and Blue Shield ins.; co to provide $500 life insurance for 1st 6 mos. of employment until elig. under current group ins. plan; improved retirement plan; 9th pd. hol.; est. 12.2¢ "plug"
Public Service of Indiana	IBEW	5/ 1/53	1,450	9¢-12¢ arb. award
Public Service Electric & Gas (maint. and installation empls.)	IBEW	5/ 1/53	4,500	5%; 8½¢ ineq. adjust. in 3 classif; night diff. inc. 1¢
Public Service Electric & Gas (office and commercial dept empls. and plant engineering empls.)	OEIU	5/ 1/53	2,100	5%
Puget Sound P & L	IBEW	1/ 1/53	1,300	6%
Salt River Project Agricultural Improvement & Power District	IBEW	1/ 1/53	.....	2¢-4½¢
South Carolina Electric & Gas	IBEW	1/ 1/53	800	8½%; sick lv. accumulated up to 45 days (was max 30 days); double time for hol. work
Toledo Edison	IBEW	6/ 1/53	1,050	Average 12¢, inc. shift diff.; co to pay ½ cost of hosp., surg., and med. plan and to pay ½ of diff. between workmen's comp. and regular earnings for 1 yr for on-the-job injuries
Virginia Electric & Power	IBEW	4/ 1/53	2,700	8%; addl. ineq. adjust. in some classif.; co to pay diff. between wages and workmen's compensation for on-the-job injuries for 1 yr. (was 3 mos)
Washington Water Power	IBEW	5/ 1/53	875	Approx. 6.2%; co to elim. 3¢ diff. below Pacific Coast rates by 5/1/54 for journeymen linemen; some classif. adjustments; 3 wks vac. after 10 yrs (was after 15 yrs)
West Penn Power	UWU	5/ 1/53	2,500	8¢; equivalent inc. for non-union "white collar" and other empls.; addl. 1¢-16¢ ineq. adjust. in 40 job classifications retroactive 5/1/52 resulting from completion of job evaluation study agmt. of 6/1/52
Wisconsin Power & Light	IBEW	6/ 1/53	1,250	10¢ shift differential inc. to 5¢ and 10¢; double time for Sunday work not on regular shift

Source: Bureau of Labor Statistics.

MANUFACTURING





Trends in Electrical Manufacturing

Total Shipments of Electrical Products 1925-1953* Indexes Based on Average Year 1947-1949 = 100

Year	1 Electrical Products	2 Appliances	3 Illuminating Equipment	4 Industrial Apparatus	5 Building Equipment & Supplies	6 Insulating Materials	7 Insulated Wire and Cable	8 Generation Transmission & Distribution Equipment
1925	17.7	6.5	11.7	15.9	29.9	21.0	39.3	24.8
1927	20.9	8.2	28.9	17.4	38.3	20.7	45.3	26.3
1929	30.4	14.0	35.2	24.2	49.1	29.7	66.9	27.9
1931	17.9	9.0	19.0	12.0	25.8	15.3	18.4	17.5
1933	10.3	6.0	7.7	7.7	17.3	14.1	15.1	5.3
1934	13.7	7.9	10.3	13.0	20.4	17.8	16.4	8.2
1935	17.0	9.8	14.5	16.6	25.1	23.6	20.6	12.4
1936	22.3	13.1	20.8	21.2	33.3	30.2	30.8	20.0
1937	27.6	14.4	23.9	27.0	39.6	33.0	38.4	30.7
1938	20.6	10.3	24.6	16.2	28.1	19.9	25.4	22.3
1939	25.0	13.3	31.8	20.3	36.8	28.0	32.0	24.0
1940	34.6	14.9	48.3	35.5	43.3	37.2	42.1	32.7
1941	48.5	20.2	65.5	61.4	71.3	68.1	73.9	48.8
1942	47.4	6.3	55.4	92.0	68.3	92.1	86.8	60.6
1943	48.2	2.5	25.8	126.9	55.3	119.9	81,1	54.4
1944	48.9	1.6	26.3	120.7	53.2	108.3	85.7	49.4
1945	42.8	5.2	40.8	83.1	53.5	86.9	58.8	42.7
1946	60.7	45.3	82.0	66.6	66.2	76.5	78.9	42.1
1947	97.9	91.7	98.6	110.4	105.1	104.3	105.5	83.2
1948	106.1	108.6	103.0	105.4	110.6	105.5	102.5	112.0
1949	96.0	99.7	98.4	83.6	84.3	90.2	92.0	104.6
1950	131.5	162.7	120.4	118.2	115.8	129.3	130.0	101.1
1951	148.0	139.9	187.9	170.6	145.2	165.6	153.4	133.2
1952	147.5	136.0	187.2	189.4	127.7	158.2	165.9	160.4
1953	157.9	150.8	133.0	199.0	122.2	183.3	173.6	164.7

1. Electrical Products index based on total shipments, including exports and interplant transfers, of electrical products which are considered to cover not only those products included in the Electrical Machinery Group as defined by the U. S. Census of Manufacturers, but also lighting fixtures, steam engines, and turbines, household and commercial refrigeration machinery, air conditioning machinery, household laundry equipment, vacuum cleaners, and electrical insulating materials such as porcelain, mica, laminated products, vulcanized fiber, varnished fabric and paper, etc.

2. Appliance index based on shipments of household refrigerators, farm and home freezers, electric ranges, water heaters, electric housewares, fans, commercial cooking equipment, dehumidifiers, household food waste disposers and dishwashers, packaged room air conditioners, dryers, ironers, washing machines, vacuum cleaners, and radio and television receiving sets.

3. Illuminating Equipment index based on shipments of industrial commercial and residential lighting fixtures and aviation ground lighting, floodlighting and street lighting equipment.

4. Industrial Apparatus index based on shipments of Carbon products, commutators, electronic tubes (except radio and cathode ray), welding wire, welding machines, resistance welders, industrial heating units and devices, industrial controls, induction and dielectric heating apparatus, mining belt conveyors, motors and generators (except large apparatus), mining and industrial electric locomotives and metallic rectifiers.

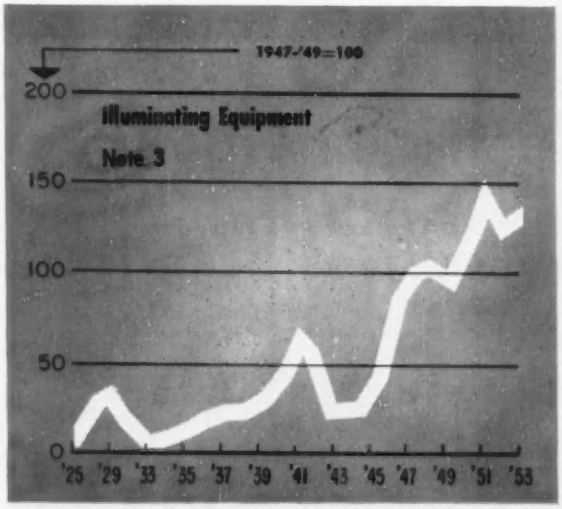
5. Building Equipment and Supplies index based on shipments of conduit fittings, metallic and plastic outlet and switch boxes, rigid steel conduit and fittings, wiring devices, molded case breakers, busways, fuses, switch and enclosed breakers, and panelboards and distribution boards.

6. Electrical Insulating Materials index based on shipments of special dry process electrical porcelain, laminated products, manufactured electrical mica, varnished fabric and paper, varnished tubing and saturated sleeving, and vulcanized fiber.

7. Insulated Wire and Cable index based on shipments of armored cable, asbestos insulated power cable, flexible cords, cord sets, magnet wire, paper cable, building wire and cable, rubber power cable, molded rubber sheathed cord and cable, and varnished cambric cable.

8. Generation, Transmission, and Distribution Equipment index based on shipments of power capacitors, electrical measuring equipment, feeder voltage regulators, hydraulic turbines, high voltage insulators, lightning protective devices, large generating and converting apparatus, marine turbine-propulsion, overhead trolley line materials, switchgear, transformers, and land steam and gas turbines.

Source: National Electrical Manufacturers Association. *Revised.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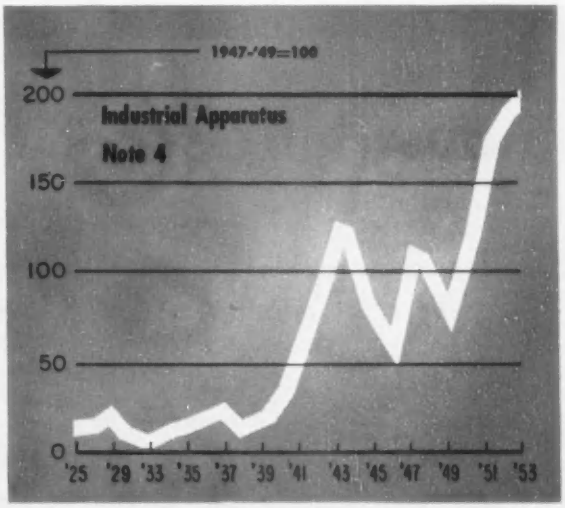
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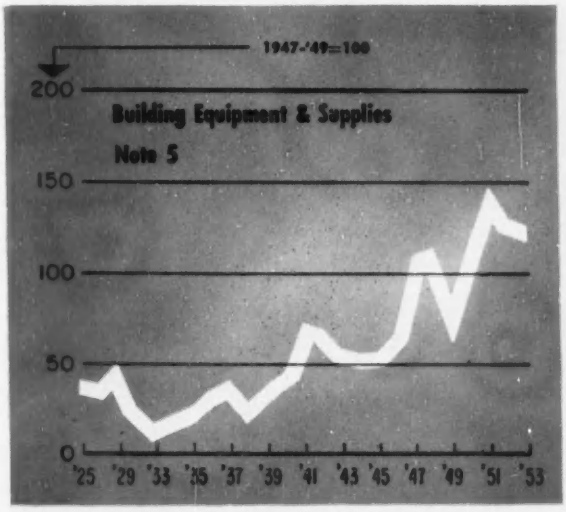
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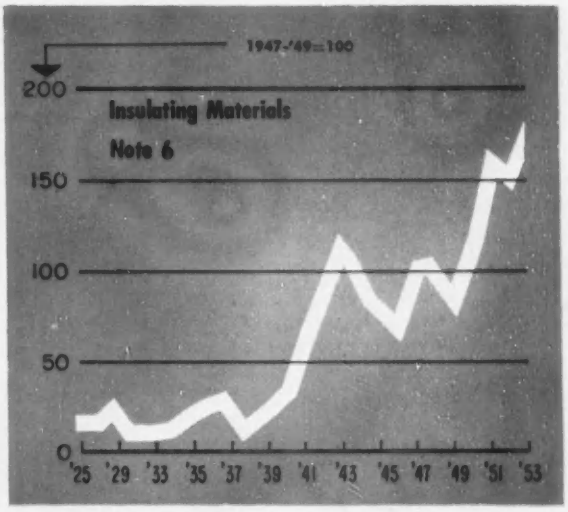
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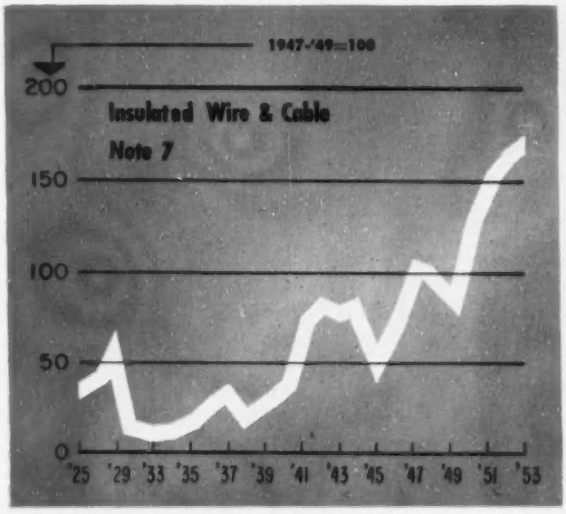
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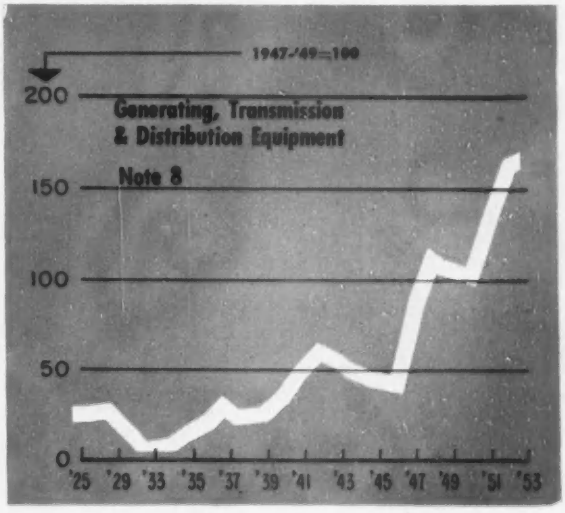
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& Distribution Equipment
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Industrial Use of Electric Energy

Manufacturers are using more than 200 billion kwhr of energy a year, and purchasing ¾ of that. Top consumers are primary metals, chemicals, and paper industries. Together they buy over half the total purchased

All Manufacturing Industries

	Purchased	Generated	Sold†	Utilized
		(Millions of Kwhr)		
1929	36,217	20,905	2,000	55,122
1939	44,847	28,593	2,922	70,518
1944	104,720	43,890	4,755	143,855
1947	102,822	43 936	5,811	140,947
1950	131,222	52,484	6,202	177,504
1951	146,531	55,401	7,106	194,826
1952	152,132	56,112	7,258	200,986

Food and Kindred Products

1929	4,016	1,080	55	5,041
1939	4,949	1,470	80	6,339
1944	7,115	1,676	67	8,724
1947	8,427	1,838	85	10,180
1950	10,827	1,897	90	12,634
1951	11,085	1,924	89	12,920
1952	11,330	1,958	90	13,198

Tobacco Manufacturers

1929	38	39	3	74
1939	66	53	4	115
1944	104	63	3	164
1947	155	76	12	219
1950	186	80	13	253
1951	202	88	14	276
1952	221	88	14	295

Textile Mill Products

1929	3,790	1,507	117	5,180
1939	5,201	1,772	171	6,802
1944	7,049	2,004	237	8,816
1947	8,288	1,959	206	10,041
1950	10,715	1,983	220	12,478
1951	11,184	1,861	156	12,849
1952	11,780	1,673	176	13,277

Apparel and Related Products

1929	253	19	1	271
1939	343	14	1	356
1944	533	13	1	545
1947	837	18	5	850
1950	1,654	15	5	1,664
1951	1,661	11	3	1,669
1952	1,752	10	3	1,759

Lumber and Products (Except Furniture)

	Purchased	Generated	Sold†	Utilized
		(Millions of Kwhr)		
1929	441	822	127	1,136
1939	660	941	186	1,415
1944	547	1,134	219	1,462
1947	1,503	1,004	169	2,338
1950	2,841	1,350	180	4,011
1951	3,199	1,369	230	4,338
1952	3,616	1,458	245	4,829

Furniture and Fixtures

1929	233	84	25	292
1939	289	113	37	365
1944	640	120	20	740
1947	705	128	7	826
1950	856	118	8	966
1951	1,133	102	6	1,229
1952	1,144	86	5	1,225

Paper and Allied Products

1929	3,141	4,645	145	7,641
1939	3,430	6,284	212	9,502
1944	3,657	8,003	662	10,998
1947	6,175	9,626	415	15,386
1950	7,697	11,910	442	19,165
1951	8,203	12,631	544	20,290
1952	8,563	12,652	545	20,670

Printing and Publishing Industries

1929	681	31	2	710
1939	812	50	3	859
1944	1,070	41	10	1,101
1947	1,251	39	10	1,280
1950	1,738	23	10	1,751
1951	2,514	21	5	2,530
1952	2,758	20	5	2,773

Chemicals and Allied Products

1929	4,331	3,126	115	7,342
1939	5,357	4,349	168	9,538
1944	19,380	10,759	852	29,287
1947	11,963	8,058	411	19,610
1950	16,001	10,395	438	25,958
1951	18,453	11,329	578	29,204
1952	19,204	11,663	595	30,272

Petroleum and Coal Products

	Purchased	Generated	Sold†	Utilized
		(Millions of Kwhr)		
1929.....	1,557	1,306	79	2,784
1939.....	1,920	1,647	115	3,452
1944.....	4,054	2,697	214	6,537
1947.....	3,753	3,246	501	6,498
1950.....	4,721	3,859	535	8,045
1951.....	5,150	4,211	648	8,713
1952.....	5,622	4,122	635	9,109

Rubber Products

1929.....	882	408	3	1,287
1939.....	1,081	508	5	1,584
1944.....	1,752	833	91	2,494
1947.....	2,650	810	15	3,445
1950.....	3,008	785	16	3,777
1951.....	3,149	731	14	3,866
1952.....	3,152	689	13	3,828

Leather and Leather Products

1929.....	227	122	14	335
1939.....	287	136	21	402
1944.....	454	119	17	556
1947.....	475	117	19	573
1950.....	592	102	20	674
1951.....	627	89	14	702
1952.....	664	91	15	740

Stone, Clay and Glass Products

1929.....	2,242	1,124	23	3,343
1939.....	2,941	1,589	34	4,496
1944.....	3,785	1,486	132	5,139
1947.....	5,865	2,155	122	7,898
1950.....	7,715	2,353	130	9,938
1951.....	8,667	2,519	141	11,045
1952.....	8,703	2,412	135	10,980

Primary Metal Industries

1929.....	9,621	5,063	1,141	13,543
1939.....	11,728	7,571	1,667	17,632
1944.....	33,789	11,193	1,824	43,158
1947.....	31,428	11,851	2,634	40,645
1950.....	38,818	14,110	2,817	50,111
1951.....	42,893	14,915	3,311	54,497
1952.....	42,341	15,619	3,467	54,493

Fabricated Metal Products

1929.....	1,255	141	10	1,386
1939.....	1,547	192	14	1,725
1944.....	3,800	175	7	3,968
1947.....	3,739	170	8	3,901
1950.....	4,793	135	9	4,919
1951.....	5,591	128	6	5,713
1952.....	5,527	119	6	5,640

Machinery (Except Electrical)

	Purchased	Generated	Sold†	Utilized
		(Millions of Kwhr)		
1929.....	1,404	273	8	1,669
1939.....	1,731	373	11	2,093
1944.....	5,249	675	62	5,862
1947.....	5,401	579	59	5,921
1950.....	6,034	520	63	6,491
1951.....	7,422	770	78	8,114
1952.....	7,735	739	75	8,399

Electrical Machinery

1929.....	880	333	38	1,175
1939.....	993	467	55	1,405
1944.....	2,838	910	90	3,658
1947.....	3,156	574	114	3,616
1950.....	3,888	798	121	4,565
1951.....	4,487	753	149	5,091
1952.....	5,018	753	149	5,622

Transportation Equipment

1929.....	847	635	64	1,418
1939.....	1,046	864	94	1,816
1944.....	7,944	1,759	243	9,460
1947.....	5,552	1,497	988	6,061
1950.....	6,991	1,714	1,050	7,655
1951.....	8,134	1,586	1,045	8,675
1952.....	9,599	1,599	1,054	10,144

Instruments and Related Products

1929.....	116	78	24	170
1939.....	145	105	35	215
1944.....	460	120	2	578
1947.....	456	90	1	545
1950.....	579	230	3	806
1951.....	662	256	3	915
1952.....	755	266	3	1,018

Miscellaneous Manufactures

1929.....	262	69	6	325
1939.....	321	95	9	407
1944.....	500	110	2	608
1947.....	1,043	101	30	1,114
1950.....	1,568	107	32	1,643
1951.....	2,115	107	32	2,190
1952.....	2,648	95	28	2,715

All Manufacturing Industries

1929.....	36,217	20,905	2,000	55,122
1939.....	44,847	28,593	2,922	70,518
1944.....	104,720	43,890	4,755	143,855
1947.....	102,822	43,936	5,811	140,947
1950.....	131,222	52,484	6,202	177,504
1951.....	146,531	55,401	7,106	194,826
1952.....	152,132	56,112	7,258	200,986

Based on data published by the Bureau of the Census, Department of Commerce and the Federal Power Commission with adjustments for comparability with 1947 classification.

† Data for 1950, 1951 and 1952 estimate based on partial coverage indicating that relation of sales to generation has not changed significantly.

REA Systems Buy 14 Billion Kwhr

In 1953 the co-ops generated and bought 18% more energy than in 1952—15.8 billion kwhr. REA's special report to Electrical World shows about 90% of this was purchased power

Two years have brought an average 40% increase in energy generated and purchased by REA-financed systems. At the end of 1953 total system input was estimated at about 15.8 billion kwhr, over 87% of which was purchased energy.

The total cost of that power, both in purchases and in outlays involved in production and transmission of generated energy, came to $122 million. This total amounts to 7.72 mills per kwhr, slightly less than the comparable figure of 7.98 mills in 1952. The cooperatives in turn sold over 13.6 billion kwhr last year, 2 billion more than in 1952.

For 1953, Rural Electrification Administration data show an increase of 411 kwhr in average annual consumer usage. That increase brings the total to 3,471 kwhr for an average annual increase of 12% for 1952 and 1953. Average yearly bill and revenue per kwhr were $92.69 and 2.67¢ respectively.

The number of consumers connected passed the 4 million mark as the cooperatives added 180,000 customers during the year, a 4.7% increase. There was a corresponding 4% increase in distribution lines, as the coops added an estimated 50,000 miles to bring the total in operation to approximately 1.3 million.

Statistics of REA—Financed Systems

	1950	1951	1952[1]	1953[2]
Cumulative Year-end Data				
Total Loans Approved	$2,311,636,614	$2,484,443,832	$2,668,946,121	$2,778,000,000
Distribution Lines	$1,879,150,367	$2,015,303,923	$2,137,839,562	$2,252,000,000
Generation and Transmission	$ 413,230,101	$ 447,643,025	$ 506,394,794	$ 505,000,000
Consumer Facilities	$ 19,256,146	$ 21,496,884	$ 24,711,765	$ 21,000,000
Funds Advanced	$1,706,207,276	$1,944,860,101	$2,157,945,900	$2,360,000,000
Systems in Operation	1,007	1,016	1,019	1,022
Miles of Line in Operation	1,088,777	1,178,515	1,244,665	1,295,000
Consumers Connected	3,413,407	3,665,966	3,851,227	4,031,000
Systems Generating Power During Year	100	92	90	86
Generating Plants—Kw Capacity	413,162	528,421	641,000	748,000
Annual Data				
Energy Generated—Kwhr	1,076,945,615	1,412,639,740	1,651,105,566	2,011,000,000
Energy Purchased—Kwhr	8,164,801,159	9,999,422,449	11,730,510,582	13,754,000,000
Total System Input—Kwhr	9,241,746,774	11,412,062,189	13,381,616,148	15,765,000,000
Energy Sold—Kwhr	7,778,734,502	9,738,485,701	11,500,196,603	13,680,000,000
Operating Revenues	$ 241,342,540[4]	$ 285,113,614[4]	$ 322,513,454	$ 365,300,000
Cost of Power[3]	$ 79,402,275	$ 94,258,294	$ 106,769,939	$ 121,700,000
Distribution Expenses—Operations	$ 18,235,988	$ 21,789,889	$ 24,841,396	$ 27,900,000
Distribution Expenses—Maintenance	$ 10,515,766	$ 12,402,360	$ 13,557,840	$ 15,300,000
Consumers Accounting & Collecting	$ 9,112,801	$ 10,698,026	$ 12,561,879	$ 13,500,000
All Other Operating Expenses	$ 32,049,916	$ 37,478,700	$ 41,806,355	$ 46,900,000
Total Operating Expenses	$ 149,316,746	$ 176,627,269	$ 199,537,409	$ 225,300,000
Net Non-operating Margin	$ 834,803	$ 994,198	$ 1,427,599	$ 2,200,000
Interest Expenses	$ 26,110,181	$ 30,828,444	$ 33,932,005	$ 36,900,000
Net Revenue Before Depreciation	$ 66,576,952[5]	$ 78,389,395[5]	$ 90,063,149[5]	$ 105,100,000[5]
Depreciation	$ 47,675,975	$ 56,806,654	$ 63,351,044	$ 70,100,000
Net Margin After Depreciation	$ 18,900,977	$ 21,582,741	$ 26,712,105	$ 35,000,000

Source: Monthly Operating Reports of REA borrowers and records of the REA.

[1] Preliminary.
[2] Based on nine months actual data and one to three months estimated.
[3] Cost of Power includes cost of purchased power and prime costs involved in the production and transmission of generated energy.
[4] Does not include revenues reported by REA borrowers from whom figures for other items were not available: $27,282 for one borrower for 1951.
[5] After deducting miscellaneous revenue deductions not shown seperately: $262,704 for 1951, $408,490 for 1952, and $200,000 for 1953.

CANADA

Canadian Power Budget $635 Million in '54

Canada's budget for new construction in 1954 will be $635 million, just about a million more than was spent last year. These are estimates based on Electrical World's survey of Canadian utilities, which also includes the Aluminum Co of Canada.

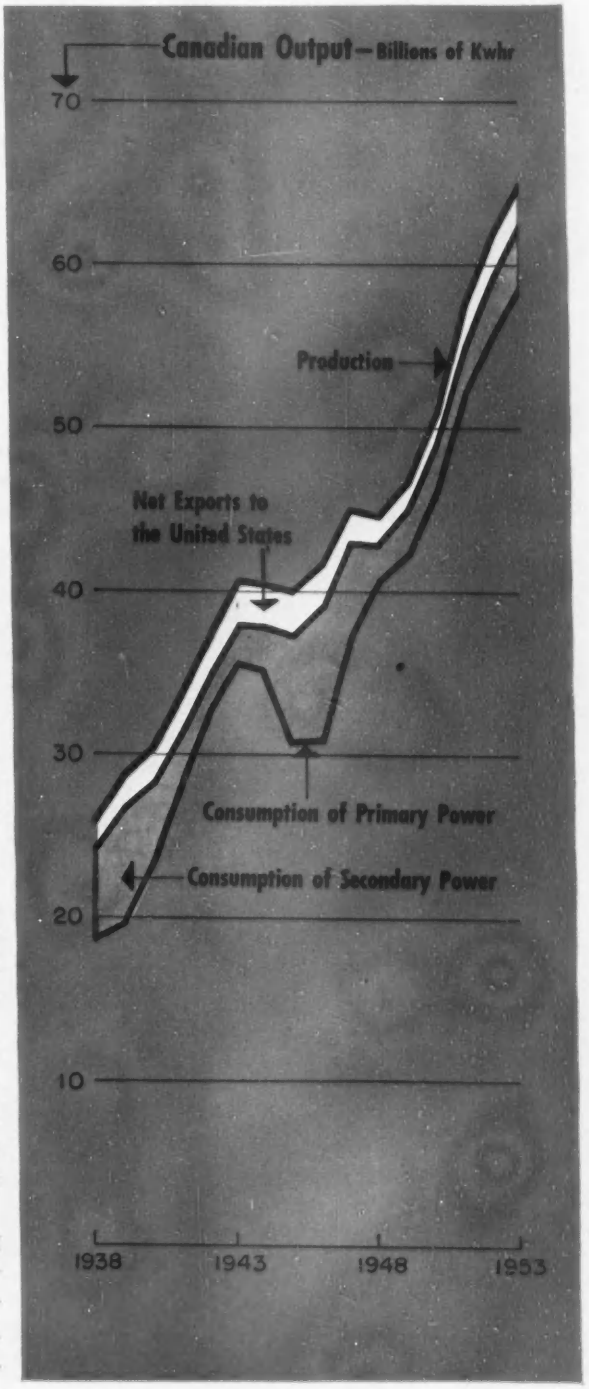
Over half the budget will be spent on generating facilities. Hydro alone will require $293 million—more than 90% of the total to be spent on generation. As compared with 1953, Canada exhibits the same pattern of behavior observed in the U. S. Both countries show a slight increase in the total budget, with cuts in spending for generation neatly offset by increases in transmission and distribution expenditures. Canada's fuel budget shows a severe slash by more than ⅓ though, while the hydro drop is about 7% below last year.

Actual hydro capacity added last year totalled 638,012 hp. The Water Resources Division of the Department of Resources and Development reports that this was somewhat lower than in recent years but still a good bit above the prewar period. The increase brings the total capacity of Canada's water plants to 14,921,459 hp, with plans to add about 1.5 million more in 1954.

Work advanced on such major hydro sites as the Kemano-Kitimat project, with plans to have 420,000 hp installed by May. In Ontario, completion of the first units of the 12-unit-1.26-million hp Sir Adam Beck project is expected early this year. The various hydro projects underway last year, however, represent less than 23% of Canada's total water resources.

Although water power is the prime source of energy, a number of large thermal units were brought into operation in 1953. Ontario Hydro-Electric Commission reported 252 Mw in steam additions, while Edmonton, Alberta, and Nova Scotia Light and Power added a total of 56 Mw.

Generally speaking, power demands were being met, though not much reserve capacity was available. The completion of important interconnections between independent generating systems, however, helped to relieve the peak-load problem.



Expenditures—Thousands of Dollars

	Fuel	Hydro	Transmission	Distribution	Miscellaneous	Total
1950	35,880	185,044	142,357	122,278	25,390	510,949
1951	56,264	243,544	121,419	136,747	21,227	579,201
1952	48,687	280,929	111,234	114,754	13,322	568,926
1953 Estimated	49,005	315,914	126,569	124,892	17,985	634,365
1954 Contemplated	31,131	293,000	154,208	128,613	28,356	635,308

	Maintenance	Transmission Line	Primary Distribution Line	Substations
1950	38,000	NA	NA	93,138
1951	43,177	NA	NA	90,365
1952	52,063	NA	NA	77,965
1953 Estimated	62,275	59,744	77,163	77,692
1954 Contemplated	67,196	76,588	78,739	85,338

Construction

	Transmission—Circuit Miles 66 kv & up	22-65.9 kv	Primary Distribution—Pole Miles	Underground—Cable Miles† Transmission	Distribution	Substation—Kva
1950	6,227‡	.....	19,627	NA	NA	3,707,000
1951	3,612‡	.....	15,919	NA	NA	3,368,000
1952	2,350‡	.....	18,418	NA	NA	4,261,000
1953 Estimated	1,773	1,021	20,734	9.4	124.2	8,797,000
1954 Contemplated	2,948	1,246	18,041	3.0	95.2	5,804,000

Source: "Electrical World" Survey. Includes expenditures and construction by the Aluminum Company of Canada. ‡Includes 22 kv & up. †Includes submarine.

Capacity Additions Reported to Electrical World—Kva

	Prime Mover	Capacity End 1952	1953	1954	1955	1956	After 1956	Total Additions Now Planned
Aluminum Co of Canada	Hydro	1,565,000	267,500	.....	.....	.....	.....	.....
Bracebridge, Ontario	Hydro	2,200	.....	.....	1,000	.....	.....	1,000
British Columbia Power Comm	Hydro	185,000	48,000	22,500	50,000	.....	.....	78,500
	Steam	2,000	.....	.....	.....	.....	.....	.....
	IC	25,500	9,000	4,000	.....	.....	.....	4,000
	Total	212,500	57,000	22,500	50,000	.....	.....	82,500
British Columbia Power Corp	Hydro	556,750	.....	50,000	.....	42,000	133,000	225,000
	Steam	12,444	.....	.....	.....	.....	.....	.....
	IC	1,450	.....	.....	.....	.....	.....	.....
	Total	570,644	.....	50,000	.....	42,000	133,000	225,000
Edmonton, Alberta	Steam	90,000	30,000	.....	30,000	.....	60,000	90,000
	IC	2,000	.....	.....	.....	.....	.....	.....
	Total	92,000	30,000	.....	30,000	.....	60,000	90,000
Edmundston, N. B	Hydro	1,100	.....	.....	.....	.....	.....	.....
	IC	1,350	.....	1,700	.....	.....	.....	1,700
	Total	2,450	.....	1,700	.....	.....	.....	1,700
Gaspe South Coop	IC	3,610	.....	.....	1,000	.....	.....	1,000
Great Lakes Power Corp	Hydro	103,950	17,000	10,000	.....	.....	.....	10,000
Manitoba Hydro-Electric Board	Hydro	93,000	.....	34,000	34,000	.....	.....	68,000
	Steam	.....	.....	.....	.....	60,000	.....	60,000
	Total	93,000	.....	34,000	34,000	60,000	.....	128,000
Medicine Hat, Alberta	Steam	18,000	5,000	.....	.....	.....	.....	.....
National L & P Co	Steam	40,000	.....	3,000	.....	.....	.....	3,000
New Westminster, B. C	Hydro	22,500	.....	.....	7,500	.....	.....	7,500
NW Territories Comm	Hydro	10,000	.....	.....	.....	.....	3,000	3,000
	IC	437	.....	.....	.....	.....	.....	.....
	Total	10,437	.....	.....	.....	.....	3,000	3,000
Nova Scotia L & P Co	Hydro	27,876	.....	8,500	.....	.....	.....	8,500
	Steam	65,750	26,000	.....	29,500	.....	60,000	89,500
	IC	2,400	.....	.....	.....	.....	.....	.....
	Total	106,026	26,000	8,500	29,500	.....	60,000	98,000
Nova Scotia Power Comm	Hydro	86,073	.....	4,500	6,000	.....	.....	10,500
	Steam	26,408	.....	.....	25,000	.....	.....	25,000
	IC	2,743	.....	.....	.....	.....	.....	.....
	Total	115,224	.....	4,500	31,000	.....	.....	35,500
Ontario Hydro-Electric Comm	Hydro	2,560,000	26,000	501,000	593,000	287,000	50,000	1,431,000
	Steam	733,000	252,000	.....	.....	.....	.....	.....
	IC	3,000	.....	.....	.....	.....	.....	.....
	Total	3,296,000	278,000	501,000	593,000	287,000	50,000	1,431,000
Regina, Saskatchewan	Steam	55,000	.....	.....	30,000	.....	.....	30,000
Riviere du Loup, Quebec	Hydro	2,160	.....	.....	.....	.....	.....	.....
	IC	2,100	1,500	.....	.....	.....	.....	.....
	Total	4,260	1,500	.....	.....	.....	.....	.....
Saskatchewan Power Corp	Steam	118,000	20,000	25,000	.....	20,000	60,000	105,000
	IC	29,300	4,300	2,500	2,500	5,000	.....	10,000
	Total	147,300	24,300	27,500	2,500	25,000	60,000	115,000
Shawinigan W & P Co	Hydro	1,207,250	.....	.....	142,000	.....	.....	142,000
Sherbrooke, Quebec	Hydro	13,805	.....	.....	.....	10,000	10,000	20,000
Weyburn, Saskatchewan	Steam	2,750	.....	3,000	.....	.....	.....	3,000
Winnipeg, Manitoba	Hydro	163,520	.....	.....	.....	.....	.....	.....
	Steam	26,000	15,000	25,000	.....	.....	.....	25,000
	Total	189,520	15,000	25,000	.....	.....	.....	25,000
	Hydro	6,610,184	358,500	636,500	833,500	339,000	196,000	2,005,000
	Steam	1,189,352	348,000	60,000	114,500	80,000	180,000	434,500
	IC	73,890	14,800	4,200	3,500	5,000	.....	12,700
	Total	7,873,426	721,300	700,700	951,500	424,000	376,000	2,452,200

Canadian Output Nears 65 Billion Kwhr

Canada generated 58.7 billion kwhr for primary consumption, 3.9 billion kwhr for secondary, and exported 2.4 billion kwhr to the U. S. in 1953, to bring total production up to 65 billion kwhr. Data for 1951 shows 57% of output goes to manufacturers, 14% to domestic users. Customers served then totalled 3.5 million, 85% of which were domestic.

Canadian Output—Kwhr

	Consumption of Primary Power	equals Production less	Consumption of Secondary Power	less	Net Exports to United States
1944	35,150,740,000	40,465,733,000	2,743,121,000		2,571,872,000
1945	30,823,539,000	40,100,608,000	6,645,824,000		2,631,245,000
1946	31,063,240,000	41,603,708,000	8,067,489,000		2,479,979,000
1947	37,375,518,000	44,986,364,000	5,595,344,000		2,014,502,000
1948	40,606,749,000	44,568,849,000	2,303,987,000		1,658,113,000
1949	42,102,584,000	46,673,214,000	2,839,940,000		1,730,690,000
1950	46,084,703,000	50,902,519,000	2,893,384,000		1,924,428,000
1951	51,916,062,000	57,420,518,000	3,136,712,000		2,367,744,000
1952	55,568,346,000	61,786,035,000	3,742,967,000		2,474,722,000
1953*	58,681,000,000	64,991,090,000	3,934,000,000		2,376,000,000

Source: Dominion Bureau of Statistics. *1953 Estimated by Electrical World. Newfoundland not included prior to 1950.

Distribution of Output—Thousands of Kwhr

	1951	% Total	Industrial Self Generation
Pulp and Paper	9,230,594	16.83	3,932,662
Primary Iron and Steel	2,179,611	3.97	215,642
Abrasives	1,121,261	2.04	
Industrial Chemicals	3,129,489	5.71	126,434
Smelting and Refining	9,993,886	18.22	624,490
Other Manufacturing	5,588,479	10.19	1,469,866
Total Manufacturing	31,243,250	56.96	6,369,094
Mining	2,616,543	4.77	212,838
Other Industries	843,198	1.54	
Domestic Service	7,726,114	14.09	
Commercial Lighting	3,159,501	5.75	
Municipal Power	795,233	1.45	
Street Lighting	320,722	0.58	
Free Service	71,444	0.13	
Exports	2,375,522	4.33	
Losses	5,707,317	10.40	
Total Utility Output	54,851,844	100.00	

Source: Dominion Bureau of Statistics.

The Canadian Electric Utility Industry

	1951	1950	1949	1948	1947	1939
Customers						
Domestic Service	2,951,988	2,797,378	2,619,831	2,398,847	2,246,253	1,623,672
Commercial Light	405,332	392,530	379,526	349,673	326,988	269,590
Power (small)	61,322	60,700	58,600	56,210	53,604	43,896
Power (large)	16,360	14,708	14,208	13,305	12,825	9,367
Power (municipal)	1,091	1,013	964	890	838	
Street Lighting	3,657	3,495	3,240	3,102	2,819	2,238
Total	3,439,750	3,269,824	3,076,369	2,822,027	2,643,327	1,941,563
Generation—Millions of Kwhr						
Hydro	52,955	46,624	42,779	41,070	42,273	27,829
Fuel	1,897	1,870	1,639	1,320	1,152	509
Total	54,852	48,494	44,418	42,390	43,425	28,338
Capacity—Thousands of Kva						
Main Plant	10,564	9,725	8,890	8,379	7,984	6,435
Auxiliary Plant	216	235	213	135	154	166
Total	10,780	9,960	9,103	8,514	8,138	6,601
Revenue—Thousands of Dollars	274,643	323,833	280,312	257,377	243,706	151,881
Expenses*—Thousands of Dollars	264,006	232,650	205,130	180,211	177,360	91,992
Pole Line Mileage	170,582	151,726	135,329	113,411	98,530	72,132

Source: Dominion Bureau of Statistics. *Includes wages, cost of power, fuel and taxes, but not other expenses.

Capacity Additions Reported to

Power Companies	Prime Mover	Capacity End 1953	1953	1954	1955	1956	After 1956	Total Additions Now Planned
Alabama Power	Hydro	489,700	.....	.....	.....	.....	.....	.....
	Steam	640,000	.....	273,000	.....	170,600	.....	443,600
	Total	1,129,700	.....	273,000	.....	170,600	.....	443,600
Appalachian Electric Power	Hydro	118,657	.....	24,000	.....	.....	.....	24,000
	Steam	1,203,390	400,000	.....	.....	.....	.....	.....
	IC	150	.....	.....	.....	.....	.....	.....
	Total	1,322,197	400,000	24,000	.....	.....	.....	24,000
Arizona P S	Hydro	7,000	.....	.....	.....	.....	.....	.....
	Steam	164,250	.....	100,000	100,000	100,000	300,000	600,000
	IC	23,026	.....	.....	.....	.....	.....	.....
	Total	194,276	.....	100,000	100,000	100,000	300,000	600,000
Arkansas P & L	Hydro	65,300	.....	.....	.....	.....	.....	.....
	Steam	472,750	105,000	270,000	.....	.....	.....	270,000
	IC	1,354	.....	.....	.....	.....	.....	.....
	Total	539,404	105,000	270,000	.....	.....	.....	270,000
Atlantic City Electric	Steam	243,000	.....	75,000	.....	.....	.....	75,000
Bangor Hydro-Electric	Hydro	40,487	.....	.....	.....	.....	.....	.....
	Steam	.....	.....	11,500	.....	.....	.....	11,500
	IC	6,000	.....	.....	2,500	.....	.....	2,500
		12,000GT	.....	.....	.....	.....	.....	.....
	Total	58,487	.....	11,500	2,500	.....	.....	14,000
Black Hills P & L	Hydro	1,346	.....	.....	.....	.....	.....	.....
	Steam	47,500	.....	.....	.....	15,000	.....	15,000
	IC	8,513	.....	.....	.....	.....	.....	.....
	Total	57,359	.....	.....	.....	15,000	.....	15,000
Boston Edison	Hydro	300	.....	.....	.....	.....	.....	.....
	Steam	720,110	.....	90,000	.....	.....	137,500	227,500
	Total	720,410	.....	90,000	.....	.....	137,500	227,500
California Electric Power	Hydro	47,570	.....	.....	.....	.....	.....	.....
	Steam	109,000	40,000	.....	45,000	.....	66,000	111,000
	IC	235	.....	.....	.....	.....	.....	.....
	Total	156,805	40,000	.....	45,000	.....	66,000	111,000
California-Oregon Power	Hydro	223,670	41,000	29,000	33,000	.....	100,000	162,000
	IC	1,085	200	.....	.....	.....	.....	.....
	Total	224,755	41,200	29,000	33,000	.....	100,000	162,000
Carolina P & L	Hydro	205,600	.....	.....	.....	.....	.....	.....
	Steam	390,500	.....	110,000	110,000	135,000	.....	355,000
	IC	1,500	.....	.....	.....	.....	.....	.....
	Total	597,600	.....	110,000	110,000	135,000	.....	355,000
Central E & G	Hydro	275	.....	.....	.....	.....	.....	.....
	IC	6,335	.....	.....	.....	.....	2,500	2,500
	Total	6,610	.....	.....	.....	.....	2,500	2,500
Central Hudson G & E	Hydro	47,020	25,000	.....	.....	.....	.....	.....
	Steam	72,000	.....	70,000	.....	.....	.....	70,000
	Total	119,020	25,000	70,000	.....	.....	.....	70,000
Central Illinois E & G	Hydro	1,200	.....	.....	.....	.....	.....	.....
	Steam	131,750	.....	.....	30,000	.....	.....	30,000
	IC	750	.....	.....	.....	.....	.....	.....
	Total	133,700	.....	.....	30,000	.....	.....	30,000
Central Illinois P S	Steam	398,000	75,000	75,000	.....	.....	.....	75,000
Central Louisiana Electric	Steam	65,000	24,000	.....	.....	50,000	50,000	100,000
	IC	19,858	.....	.....	.....	.....	.....	.....
	Total	84,858	24,000	.....	.....	50,000	50,000	100,000
Central Maine Power	Hydro	190,579	.....	47,400	30,000	.....	.....	77,400
	Steam	158,000	.....	.....	.....	50,000	.....	50,000
	IC	2,442	.....	.....	.....	.....	.....	.....
		4,000GT	.....	.....	.....	.....	.....	.....
	Total	355,021	.....	47,400	30,000	50,000	.....	127,400
Central P & L	Hydro	15,000	.....	.....	.....	.....	.....	.....
	Steam	217,000	.....	66,000	99,000	.....	66,000	231,000
	IC	4,889	.....	.....	.....	.....	.....	.....
	Total	236,889	.....	66,000	99,000	.....	66,000	231,000
Central Vermont P S	Hydro	41,000	.....	.....	.....	10,000	.....	10,000
	Steam	4,500	.....	.....	.....	.....	.....	.....
	IC	2,500	.....	.....	.....	.....	.....	.....
		12,000GT	6,000GT	.....	.....	6,000GT	.....	6,000 GT
	Total	60,000	6,000	.....	.....	16,000	.....	16,000
Cincinnati G & E and Union L H & P	Steam	760,000	100,000	125,000	.....	.....	.....	125,000
Cleveland Electric Illuminating	Steam	1,160,000	250,000	125,000	208,000	.....	.....	333,000
Commonwealth Edison & Sub	Hydro	6,865	.....	.....	.....	.....	.....	.....
	Steam	3,303,500	210,000	300,000	341,000	.....	.....	641,000
	Total	3,310,365	210,000	300,000	341,000	.....	.....	641,000
Consolidated Edison	Steam	3,465,000	180,000	180,000	180,000	.....	.....	360,000
Consolidated G E L & P of Baltimore	Steam	830,500	75,000	.....	125,000	.....	.....	125,000
Connecticut L & P	Hydro	73,470	.....	.....	36,000	.....	.....	36,000
	Steam	373,000	.....	75,000	.....	100,000	.....	175,000
	IC	15,000GT	15,000GT	5,000GT	.....	.....	.....	5,000 GT
	Total	461,470	15,000	80,000	36,000	100,000	.....	216,000
Consumers Power	Hydro	153,120	.....	.....	.....	.....	.....	.....
	Steam	1,160,000	112,500	.....	142,000	142,000	.....	284,000
	IC	6,498	.....	.....	.....	.....	.....	.....
	Total	1,319,618	112,500	.....	142,000	142,000	.....	284,000
Dahlberg L & P	Hydro	819	562	.....	.....	.....	.....	.....
	IC	906	.....	.....	.....	.....	.....	.....
	Total	1,725	562	.....	.....	.....	.....	.....

Electrical World—Kw . . . . . See notes on page 198.

Power Companies	Prime Mover	Capacity End 1953	1953	1954	1955	1956	After 1956	Total Additions Now Planned
Dallas P & L	Steam	336,250	87,000	75,000	115,000	115,000	165,000	470,000
	IC	6,000	.....	.....	.....	.....	.....	.....
	Total	342,250	87,000	75,000	115,000	115,000	165,000	470,000
Dayton P & L	Steam	580,000	70,000	.....	.....	.....	.....	.....
Delaware P & L	Steam	148,600	.....	75,000	.....	.....	75,000	150,000
Detroit Edison	Hydro	7,850	.....	.....	.....	.....	.....	.....
	Steam	1,950,000	300,000	300,000	.....	490,000	.....	790,000
	Total	1,957,850	300,000	300,000	.....	490,000	.....	790,000
Duke Power	Hydro	499,073	.....	.....	.....	.....	.....	.....
	Steam	1,429,400	270,000	280,000	150,000	.....	.....	430,000
	IC	575	.....	.....	.....	.....	.....	.....
	Total	1,929,048	270,000	280,000	150,000	.....	.....	430,000
Duquesne Light	Steam	914,000	58,100	120,000	150,000	.....	.....	270,000
Edison Sault Elec	Steam	.....	.....	.....	.....	.....	5,000	5,000
	IC	2,280	.....	.....	1,500	1,500	1,500	4,500
	Total	2,280	.....	.....	1,500	1,500	6,500	9,500
Electric Energy Inc	Steam	312,500	312,500	312,500	312,500	.....	.....	625,000
El Paso Electric	Steam	126,450*	.....	35,000	.....	.....	.....	35,000
Empire District Electric	Hydro	19,925	.....	.....	.....	.....	.....	.....
	Steam	97,500	.....	48,000	.....	.....	.....	48,000
	IC	2,276	.....	.....	.....	.....	.....	.....
	Total	119,701	.....	48,000	.....	.....	.....	48,000
Florida Power	Hydro	12,493	.....	.....	.....	.....	.....	.....
	Steam	346,000	121,000	31,000	70,000	105,000	.....	206,000
	IC	5,628	.....	.....	.....	.....	.....	.....
	Total	364,121	121,000	31,000	70,000	105,000	.....	206,000
Florida P & L	Steam	652,300	80,000	80,000	135,000	30,000	.....	295,000
	IC	10,050	.....	.....	.....	.....	.....	.....
	Total	662,350	80,000	80,000	135,000	80,000	.....	295,000
Georgia Power	Hydro	351,830	45,000	.....	10,000	.....	.....	10,000
	Steam	796,500	.....	220,000	120,000	.....	340,000	680,000
	Total	1,148,330	45,000	220,000	130,000	.....	340,000	690,000
Green Mountain Power	Hydro	26,650	5,520	.....	.....	.....	.....	.....
	Steam	7,800	.....	27,000	.....	.....	.....	27,000
	IC	4,000	.....	.....	.....	.....	.....	.....
	Total	38,450	5,520	27,000	.....	.....	.....	27,000
Gulf Power	Steam	155,000	93,000	.....	.....	.....	.....	.....
Gulf States Utilities	Steam	578,500	66,000	83,000	.....	100,000	100,000	283,000
Hartford Electric Light	Hydro	1,500	.....	.....	.....	.....	.....	.....
	Steam	260,000	.....	66,000	.....	.....	99,000	165,000
	IC	.....	.....	.....	.....	.....	.....	.....
	Total	261,500	.....	66,000	.....	.....	99,000	165,000
Houston L & P	Steam	815,000	230,000	115,000	295,000	180,000	.....	590,000
Idaho Power	Hydro	350,430	.....	.....	.....	151,000	632,000	783,000
	Steam	.....	.....	.....	100,000	.....	.....	100,000
	IC	1,497	.....	.....	.....	.....	.....	.....
	Total	351,927	.....	.....	100,000	151,000	632,000	883,000
Illinois Power	Hydro	1,500	.....	.....	.....	.....	.....	.....
	Steam	515,800	75,000	175,000	.....	100,000	.....	275,000
	IC	2,000	.....	.....	.....	.....	.....	.....
	Total	519,300	75,000	175,000	.....	100,000	.....	275,000
Indiana-Kentucky Electric	Steam	.....	.....	.....	800,000	400,000	.....	1,200,000
Indiana & Michigan Electric	Hydro	23,504	.....	.....	.....	.....	.....	.....
	Steam	675,000	.....	200,000	.....	.....	.....	200,000
	Total	698,504	.....	200,000	.....	.....	.....	200,000
Interstate Power	Hydro	5,442	.....	.....	.....	.....	.....	.....
	Steam	135,750	.....	.....	.....	.....	33,000	33,000
	IC	4,035	.....	.....	.....	.....	.....	.....
	Total	145,227	.....	.....	.....	.....	33,000	33,000
Iowa E L & P	Hydro	5,134	.....	.....	.....	.....	.....	.....
	Steam	180,625	17,250	30,000	30,000	.....	.....	60,000
	IC	38,183	.....	.....	.....	.....	.....	.....
	Total	223,942	17,250	30,000	30,000	.....	.....	60,000
Iowa-Illinois G & E	Hydro	4,000	.....	.....	.....	.....	.....	.....
	Steam	221,479	25,000	18,600	.....	.....	.....	18,600
	IC	1,000	.....	.....	.....	.....	.....	.....
	Total	226,479	25,000	18,600	.....	.....	.....	18,600
Iowa P & L	Hydro	400	.....	.....	.....	.....	.....	.....
	Steam	153,750	.....	110,000	.....	66,000	.....	176,000
	IC	10,347	.....	.....	.....	.....	.....	.....
	Total	164,497	.....	110,000	.....	66,000	.....	176,000
Iowa P S	Hydro	2,051	.....	.....	.....	.....	.....	.....
	Steam	166,300	16,900	.....	.....	.....	44,000	44,000
	IC	26,115	.....	.....	.....	.....	.....	.....
	Total	194,466	16,900	.....	.....	.....	44,000	44,000
Iowa Southern Utilities	Steam	83,550	44,000	.....	22,000	.....	.....	22,000
	IC	5,000	.....	.....	.....	.....	.....	.....
	Total	88,550	44,000	.....	22,000	.....	.....	22,000
Jersey Central P & L	Steam	241,500	62,500	.....	137,500	.....	.....	137,500
Kansas City P & L	Steam	584,750	99,000	.....	99,000	.....	.....	99,000

Power Companies	Prime Mover	Capacity End 1953	1953	1954	1955	1956	After 1956	Total Additions Now Planned
Kansas G & E	Hydro	273	.....	.....	.....	.....	.....	.....
	Steam	185,000	.....	140,000	.....	.....	.....	140,000
	IC	1,760	.....	.....	.....	.....	.....	.....
	Total	187,035	.....	140,000	.....	.....	.....	140,000
Kentucky Utilities	Hydro	30,540	.....	.....	.....	.....	.....	.....
	Steam	275,500	75,000	75,000	.....	75,000	.....	150,000
	Total	306,040	75,000	75,000	.....	75,000	.....	150,000
Lake Superior District Power	Hydro	11,968	.....	11,968	.....	.....	.....	11,968
	Steam	55,000	.....	60,000	.....	.....	.....	60,000
	IC	4,000	.....	4,000	.....	.....	.....	4,000
	Total	70,968	.....	75,968	.....	.....	.....	75,968
Long Island Lighting	Steam	497,600	110,000	110,000	.....	160,000	160,000	430,000
Louisville G & E	Hydro	80,320	.....	.....	.....	.....	.....	.....
	Steam	425,000	.....	100,000	100,000	.....	.....	200,000
	Total	505,320	.....	100,000	100,000	.....	.....	200,000
Louisiana P & L	Steam	327,700	108,000	.....	135,000	.....	.....	135,000
	IC	596	.....	.....	.....	.....	.....	.....
	Total	328,296	108,000	.....	135,000	.....	.....	135,000
Lynn G & E	Steam	58,480	.....	.....	.....	.....	20,000	20,000
Monongahela Power & Sub	Steam	305,325	.....	135,000	.....	.....	135,000	270,000
	IC	3,698	.....	.....	.....	.....	.....	.....
	Total	309,023	.....	135,000	.....	.....	135,000	270,000
Montana Power	Hydro	365,940	.....	60,000	.....	.....	.....	60,000
	Steam	60,000	.....	.....	.....	.....	.....	.....
	Total	425,940	.....	60,000	.....	.....	.....	60,000
Montaup Electric	Steam	190,000	.....	.....	.....	.....	70,000	70,000
Minnesota P & L	Hydro	106,940	.....	.....	.....	.....	.....	.....
	Steam	240,500	92,000	.....	.....	.....	.....	.....
	Total	347,440	92,000	.....	.....	.....	.....	.....
Mississippi Power	Steam	147,500	47,600	.....	.....	.....	75,000	75,000
	IC	840	.....	.....	.....	.....	.....	.....
	Total	148,340	47,600	.....	.....	.....	75,000	75,000
Mississippi P & L	Steam	407,000	210,000	.....	.....	.....	.....	.....
	IC	535	.....	.....	.....	.....	.....	.....
	Total	407,535	210,000	.....	.....	.....	.....	.....
Missouri Utilities	Steam	27,800	.....	.....	.....	.....	.....	.....
	IC	2,000	.....	.....	5,000	.....	.....	5,000
	Total	29,800	.....	.....	5,000	.....	.....	5,000
Mountain States Power	Hydro	6,814	.....	.....	.....	.....	.....	.....
	Steam	31,810	.....	.....	24,000	.....	.....	24,000
	IC	5,050	.....	.....	800	.....	.....	800
	Total	43,674	.....	.....	24,800	.....	.....	24,800
Nantahala P & L	Hydro	88,435	9,000	10,800	.....	.....	.....	10,800
Nantucket G & E	Steam	1,500	.....	.....	.....	.....	.....	.....
	IC	1,700	1,000	.....	.....	.....	2,000	2,000
	Total	3,200	1,000	.....	.....	.....	2,000	2,000
Nappanee Utilities	Steam	4,300	1,800	.....	.....	.....	.....	.....
New England Electric System	Hydro	341,000	.....	.....	.....	150,000	.....	150,000
	Steam	657,000	.....	90,000	.....	.....	.....	90,000
	IC	5,000	.....	5,000	.....	.....	.....	5,000
	Total	1,003,000	.....	95,000	.....	150,000	.....	245,000
New Mexico Electric Service	Steam	.....	.....	.....	.....	20,000	20,000	40,000
	IC	3,429	.....	.....	.....	.....	.....	.....
	Total	3,429	.....	.....	.....	20,000	20,000	40,000
New England G &E Assoc	Steam	197,250	.....	10,000	.....	.....	72,000	82,000
	IC	2,527	.....	.....	.....	.....	.....	.....
	Total	199,777	.....	10,000	.....	.....	72,000	82,000
New Orleans Public Service	Steam	333,000**	.....	82,000	.....	.....	.....	82,000
New York State E & G	Hydro	41,465	19,050	.....	.....	.....	.....	.....
	Steam	390,250	.....	100,000	135,000	.....	.....	235,000
	IC	2,968	2,280	.....	.....	.....	.....	.....
	Total	434,683	21,330	100,000	135,000	.....	.....	235,000
Niagara Mohawk	Hydro	1,037,899	.....	41,850	22,500	14,400	.....	78,750
	Steam	1,617,350	294,000	98,000	.....	.....	.....	98,000
	Total	2,655,249	294,000	139,850	22,500	14,400	.....	176,750
Northern Indiana P S	Hydro	19,005	.....	.....	.....	.....	.....	.....
	Steam	204,030	.....	.....	.....	137,500	.....	137,500
	Total	223,035	.....	.....	.....	137,500	.....	137,500
Northern States Power	Hydro	166,990	.....	.....	.....	.....	.....	.....
	Steam	787,670	44,000	100,000	100,000	100,000	.....	300,000
	IC	30,755	.....	.....	.....	.....	.....	.....
	Total	985,415	44,000	100,000	100,000	100,000	.....	300,000
Northwestern L & P	IC	9,505	1,135	.....	.....	.....	.....	.....
Ohio Edison & Sub	Hydro	1,950	.....	.....	.....	.....	.....	.....
	Steam	1,241,850	106,000	241,000	135,000	.....	.....	376,000
	IC	256	.....	.....	.....	.....	.....	.....
	Total	1,244,056	106,000	241,000	135,000	.....	.....	376,000
Ohio Power	Hydro	3,000	.....	.....	.....	.....	.....	.....
	Steam	824,750	200,000	200,000	120,000	.....	.....	320,000
	Total	827,750	200,000	200,000	120,000	.....	.....	320,000
Ohio Valley Electric	Steam	.....	.....	.....	600,000	400,000	.....	1,000,000
Oklahoma G & E	Steam	391,760	81,500	.....	110,000	.....	110,000	220,000
	IC	5,335	.....	.....	.....	.....	.....	.....
		7,500GT	.....	.....	.....	.....	.....	.....
	Total	404,595	81,500	.....	110,000	.....	110,000	220,000

Power Companies	Prime Mover	Capacity End 1953	1953	1954	1955	1956	After 1956	Total Additions Now Planned
Otter Tail Power	Hydro	5,855	.....	.....	.....	.....	.....	.....
	Steam	94,000	.....	.....	.....	.....	30,000	30,000
	IC	23,545	3,400	.....	.....	.....	.....	.....
	Total	123,400	3,400	.....	.....	.....	30,000	30,000
Pacific G & E	Hydro	1,358,400	.....	.....	84,000	.....	.....	84,000
	Steam	2,192,800	235,000	600,000	300,000	50,000	717,500	1,667,500
	Total	3,545,200	235,000	600,000	384,000	50,000	717,500	1,751,500
Pacific P & L	Hydro	231,730	123,000	.....	.....	.....	.....	.....
	Steam	52,500	.....	.....	.....	.....	.....	.....
	IC	1,000	.....	.....	.....	.....	.....	.....
	Total	285,230	123,000	.....	.....	.....	.....	.....
Pennsylvania Electric	Hydro	58,100	.....	.....	.....	.....	.....	.....
	Steam	494,362	18,750	275,000	.....	.....	137,500	412,500
	Total	546,462	18,750	275,000	.....	.....	137,500	412,500
Pennsylvania P & L	Hydro	42,640	.....	.....	.....	.....	.....	.....
	Steam	744,962	130,000	132,500	.....	132,500	.....	265,000
	Total	787,602	130,000	132,500	.....	132,500	.....	265,000
Pennsylvania Water & Power	Hydro	104,000	.....	.....	.....	.....	.....	.....
	Steam	30,000	.....	74,000	.....	.....	.....	74,000
	Total	134,000	.....	74,000	.....	.....	.....	74,000
Philadelphia Electric & Sub	Hydro	252,000	.....	.....	.....	.....	.....	.....
	Steam	1,790,250	250,000	150,000	200,000	.....	250,000	600,000
	Total	2,042,250	250,000	150,000	200,000	.....	250,000	600,000
Portland General Electric	Hydro	105,925	29,400	.....	.....	.....	.....	.....
	Steam	98,000	.....	.....	.....	.....	.....	.....
	Total	203,925	29,400	.....	.....	.....	.....	.....
Potomac Electric Power	Steam	690,000	.....	100,000	100,000	.....	.....	200,000
P S of Colorado	Hydro	41,635	.....	.....	.....	.....	.....	.....
	Steam	307,100	.....	76,000	100,000	15,000	100,000	291,000
	IC	2,250	.....	.....	.....	.....	.....	.....
	Total	350,985	.....	76,000	100,000	15,000	100,000	291,000
P S of Indiana	Hydro	3,200	.....	.....	.....	.....	.....	.....
	Steam	650,000	200,000	200,000	125,000	.....	.....	325,000
	IC	8,640	.....	.....	.....	.....	.....	.....
	Total	661,840	200,000	200,000	125,000	.....	.....	325,000
P S of New Hampshire	Hydro	77,350	.....	.....	.....	.....	.....	.....
	Steam	148,750	.....	.....	50,000	.....	.....	50,000
	IC	3,000	.....	.....	.....	.....	.....	.....
	Total	229,100	.....	.....	50,000	.....	.....	50,000
P S E & G of New Jersey	Steam	1,910,300	290,000	.....	185,000	200,000	200,000	585,000
P S of New Mexico	Steam	94,000	22,000	33,000	.....	.....	33,000	66,000
Rochester G & E	Hydro	49,040	.....	.....	.....	.....	.....	.....
	Steam	294,750	70,000	.....	.....	.....	.....	.....
	IC	.....	.....	.....	.....	.....	.....	.....
	Total	343,790	70,000	.....	.....	.....	.....	.....
Rockland L & P	Hydro	25,750	.....	.....	18,000	.....	.....	18,000
	Steam	54,275	.....	.....	70,000	.....	.....	70,000
	Total	80,025	.....	.....	88,000	.....	.....	88,000
Rumford Falls Power	Hydro	25,000	.....	12,800	.....	.....	.....	12,800
San Diego G & E	Steam	287,000	.....	106,000	.....	106,000	.....	212,000
Savannah E & P	Steam	55,500	.....	24,000	.....	36,000	.....	60,000
Scranton Electric	Steam	162,700	46,000	.....	.....	.....	.....	.....
South Carolina E & G	Hydro	174,360	.....	.....	.....	.....	.....	.....
	Steam	251,500	84,000	84,000	110,000	.....	125,000	319,000
	IC	150	.....	.....	.....	.....	.....	.....
	Total	426,010	84,000	84,000	110,000	.....	125,000	319,000
Southern California Edison	Hydro	938,720	15,000	.....	.....	.....	.....	.....
	Steam	875,500	250,000	113,000	156,000	.....	.....	269,000
	IC	30,000	.....	.....	.....	.....	.....	.....
	Total	1,844,220	265,000	113,000	156,000	.....	.....	269,000
Southern Colorado Power	Hydro	1,500	.....	.....	.....	.....	.....	.....
	Steam	53,048	.....	.....	18,000	.....	.....	18,000
	Total	54,548	.....	.....	18,000	.....	.....	18,000
Southern Indiana G & E	Steam	.....	.....	.....	44,100	.....	.....	44,100
Southwestern G & E	Steam	207,750	.....	44,000	.....	75,000	.....	119,000
Southwestern P S	Hydro	410	.....	.....	.....	.....	.....	.....
	Steam	437,500	112,500	105,000	112,500	.....	.....	217,500
	IC	13,778	.....	.....	.....	.....	.....	.....
	Total	451,688	112,500	105,000	112,500	.....	.....	217,500
St. Joseph L & P	Steam	64,340	.....	.....	.....	.....	20,000	20,000
	IC	680	.....	.....	.....	.....	.....	.....
	Total	65,020	.....	.....	.....	.....	20,000	20,000
Tampa Electric	Steam	188,500	46,000	.....	69,000	.....	.....	69,000
Texas Electric Service	Steam	465,748	.....	180,000	.....	156,000	.....	336,000
	IC	11,948	.....	.....	.....	.....	.....	.....
	Total	477,696	.....	180,000	.....	156,000	.....	336,000
Texas P & L	Steam	257,300	82,000	110,000	153,000	.....	.....	263,000
	IC	10,950	.....	.....	.....	.....	.....	.....
	Total	268,250	82,000	110,000	153,000	.....	.....	263,000
Toledo Edison	Hydro	5,000	.....	.....	.....	.....	.....	.....
	Steam	330,000	.....	.....	135,000	.....	.....	135,000
	Total	335,000	.....	.....	135,000	.....	.....	135,000
Union Electric of Missouri & Sub	Hydro	300,600	50,000	.....	.....	.....	.....	.....
	Steam	994,000	140,000	140,000	.....	.....	400,000	540,000
	Total	1,294,600	190,000	140,000	.....	.....	400,000	540,000

Power Companies	Prime Mover	Capacity End 1953	1953	1954	1955	1956	After 1956	Total Additions Now Planned
Utah P & L	Hydro	176,380	.....	.....	.....	.....	.....	.....
	Steam	244,750	.....	66,000	105,000	.....	.....	171,000
	IC	3,126	.....	1,000	.....	.....	.....	1,000
	Total	424,256	.....	67,000	105,000	.....	.....	172,000
Virginia E & P	Hydro	44,605	.....	.....	100,000	.....	87,000	187,000
	Steam	828,500	105,000	105,000	105,000	.....	.....	210,000
	IC	2,490	.....	.....	.....	.....	.....	.....
	Total	875,595	105,000	105,000	205,000	.....	87,000	397,000
Washington Water Power	Hydro	403,210	100,000	.....	.....	.....	.....	.....
Western Colorado Power	Hydro	13,238	.....	.....	.....	.....	.....	.....
	Steam	18,500	6,000	.....	8,500	.....	.....	8,500
	Total	31,738	6,000	.....	8,500	.....	.....	8,500
Western Light & Telephone	Steam	49,850	15,000	.....	15,000	.....	.....	15,000
	IC	20,746	.....	.....	.....	.....	.....	.....
	Total	63,596	15,000	.....	15,000	.....	.....	15,000
Western Massachusetts Electric	Hydro	99,875	.....	.....	.....	.....	.....	.....
	Steam	175,100	.....	.....	.....	.....	75,000	75,000
	Total	274,975	.....	.....	.....	.....	75,000	75,000
West Penn Power & Sub	Hydro	50,000	.....	.....	.....	.....	.....	.....
	Steam	704,000	.....	135,000	.....	.....	.....	135,000
	IC	.....	.....	.....	.....	.....	.....	.....
	Total	754,000	.....	135,000	.....	.....	.....	135,000
West Texas Utilities	Steam	197,000	66,000	.....	33,000	.....	.....	33,000
	IC	15,470	.....	.....	.....	.....	.....	.....
		5,000GT	.....	4,000GT	.....	.....	.....	4,000 GT
	Total	217,470	66,000	4,000	33,000	.....	.....	37,000
Wisconsin Electric Power	Hydro	915	.....	.....	.....	.....	.....	.....
	Steam	954,000	120,000	120,000	120,000	.....	120,000	360,000
	Total	954,915	120,000	120,000	120,000	.....	120,000	360,000
Wisconsin Hydro Electric	Hydro	4,402	.....	.....	1,000	.....	.....	1,000
	IC	5,900	.....	.....	.....	.....	.....	.....
	Total	10,302	.....	.....	1,000	.....	.....	1,000
Wisconsin P & L	Hydro	42,200	230	.....	.....	.....	.....	.....
	Steam	239,700	65,000	.....	65,000	.....	200,000	265,000
	Total	281,900	65,230	.....	65,000	.....	200,000	265,000
Wisconsin P S and Sub	Hydro	63,546	.....	.....	.....	.....	.....	.....
	Steam	212,250	.....	66,000	.....	.....	.....	66,000
	IC	3,000	.....	.....	.....	.....	.....	.....
	Total	278,796	.....	66,000	.....	.....	.....	66,000
Power Companies	**Hydro**	**10,030,881**	**462,762**	**237,819**	**334,500**	**335,400**	**819,000**	**1,716,719**
	Steam	**56,351,064**	**7,331,900**	**8,926,100**	**7,754,100**	**4,041,400**	**4,596,500**	**25,292,300**
	IC	**497,154**	**29,015**	**19,000**	**9,000**	**7,500**	**6,000**	**42,300**
	Total	**66,879,099**	**7,813,677**	**9,182,918**	**8,098,400**	**4,394,500**	**5,375,500**	**27,051,318**
Federal Systems								
Bureau of Reclamation	Hydro	4,580,367	159,167	174,084	217,500	.....	737,510	1,129,094
Corps of Engineers	Hydro	2,183,600	743,000	757,400	849,200	687,000	9,750,700	11,984,300
International Boundary & Water Comm	Hydro	10,500	10,500	21,000	.....	.....	.....	21,000
Tennessee Valley Authority	Hydro	3,484,935	239,000	73,000	74,500	75,000	.....	222,500
	Steam	2,102,250	847,000	2,450,000	1,750,000	450,000	.....	4,650,000
	Total	5,587,185	1,086,000	2,523,000	1,824,500	525,000	.....	4,872,500
Federal Systems	**Hydro**	**10,199,402**	**1,151,667**	**1,025,484**	**1,141,200**	**762,000**	**10,488,210**	**13,356,894**
	Steam	**2,102,250**	**847,000**	**2,450,000**	**1,750,000**	**450,000**	.....	**4,650,000**
	Total	**12,301,652**	**1,998,667**	**3,475,484**	**2,891,200**	**1,212,000**	**10,488,210**	**18,006,894**
Municipal, State & Power District Systems								
Burbank, Cal	Steam	70,000	33,000	.....	.....	.....	33,000	33,000
Glendale, Cal	Steam	60,000	20,000	.....	.....	.....	20,000	20,000
Los Angeles, Cal	Hydro	733,000	37,500	.....	.....	.....	.....	.....
	Steam	531,000	100,000	256,000	156,000	.....	.....	412,000
	Total	1,264,000	137,500	256,000	156,000	.....	.....	412,000
Pasadena, Cal	Steam	.....	.....	40,000	.....	40,000	.....	80,000
Colorado Springs, Colo	Hydro	6,000	.....	.....	.....	.....	.....	.....
	Steam	40,000	16,500	16,500	.....	.....	.....	16,500
	Total	46,000	16,500	16,500	.....	.....	.....	16,500
Ft. Collins, Colo	Steam	10,000	10,000	.....	.....	.....	.....	.....
Lamar, Colo	Steam	9,000	.....	.....	.....	7,500	.....	7,500
	IC	2,000	.....	.....	.....	.....	.....	.....
	Total	11,000	.....	.....	.....	7,500	.....	7,500
Norwich, Conn	Hydro	1,600	.....	.....	.....	.....	.....	.....
	Steam	14,250	.....	.....	.....	.....	.....	.....
	IC	.....	.....	.....	5,000GT	.....	5,000GT	10,000 GT
	Total	15,850	.....	.....	5,000	.....	5,000	10,000
Wallingford, Conn	Steam	22,500	.....	.....	.....	10,000	.....	10,000
Jacksonville, Fla	Steam	167,500	.....	42,500	42,500	.....	.....	85,000
Lakeland, Fla	Steam	.....	.....	25,000	.....	.....	.....	25,000
Orlando, Fla	Steam	43,000	.....	30,000	.....	.....	.....	30,000
Thomasville, Ga	Steam	15,500	.....	.....	.....	.....	11,500	11,500
Princeton, Ill	IC	.....	2,340	.....	.....	.....	.....	.....
Springfield, Ill	Steam	80,000	20,000	.....	.....	.....	.....	.....
Winnetka, Ill	Steam	18,000	7,500	.....	.....	.....	7,500	7,500
Woodstock, Ill	Steam	14,000	.....	.....	.....	.....	10,000	10,000
	IC	300	300	.....	.....	.....	.....	.....
	Total	14,300	300	.....	.....	.....	10,000	10,000
Columbia City, Ind	Steam	2,000	2,500	.....	3,500	.....	.....	3,500
Crawfordsville, Ind	Steam	16,000	.....	11,500	.....	.....	.....	11,500

Municipal Systems	Prime Mover	Capacity End 1953	1953	1954	1955	1956	After 1956	Total Additions Now Planned
Richmond, Ind.	Steam	37,100	.....	30,000	.....	.....	30,000	60,000
Ames, Iowa	Steam	15,500	.....	.....	.....	.....	10,000	10,000
	IC	1,000	.....	.....	.....	.....	.....	.....
	Total	16,500	.....	.....	.....	.....	10,000	10,000
Bellevue, Iowa	IC	2,152	928	.....	.....	.....	.....	.....
Cascade, Iowa	IC	1,403	.....	.....	.....	700	.....	700
Cedar Falls, Iowa	Hydro	1,200	.....	.....	.....	.....	.....	.....
	Steam	9,000	.....	5,000	.....	.....	.....	5,000
	IC	1,200	.....	.....	.....	.....	.....	.....
	Total	11,400	.....	5,000	.....	.....	.....	5,000
Gowrie, Iowa	IC	.....	.....	750	.....	.....	.....	750
Lenox, Iowa	IC	572	.....	360	.....	.....	.....	360
Muscatine, Iowa	Steam	27,250	.....	.....	.....	.....	20,000	20,000
	IC	300	.....	.....	.....	.....	.....	.....
	Total	27,550	.....	.....	.....	.....	20,000	20,000
Ramsen, Iowa	IC	1,181	.....	.....	1,000	.....	.....	1,000
West Bend, Iowa	IC	2,032	984	.....	.....	.....	.....	.....
Kansas City, Kan	Steam	129,000	.....	40,000	.....	.....	40,000	80,000
Lincoln Center, Kan	IC	1,339	.....	.....	895	.....	.....	895
McPherson, Kan	Steam	15,500	.....	.....	12,500	.....	.....	12,500
	IC	1,000	.....	.....	.....	.....	.....	.....
	Total	16,500	.....	.....	12,500	.....	.....	12,500
Meade, Kan	IC	1,772	.....	.....	.....	.....	600	600
Owensboro, Ky	Steam	22,500	.....	30,000	.....	.....	.....	30,000
Natchitoches, La	IC	4,902	.....	.....	7,102	.....	.....	7,102
Ruston, La	IC	4,825	.....	3,080	.....	.....	.....	3,080
Braintree, Mass	Steam	23,000	10,000	.....	.....	.....	.....	.....
Hudson, Mass	IC	8,500	.....	.....	.....	3,000	.....	3,000
Taunton, Mass	Steam	35,000	10,000	20,000	.....	.....	.....	20,000
Coldwater, Mich	Steam	6,000	3,000	.....	.....	.....	.....	.....
	IC	2,000	.....	.....	.....	.....	.....	.....
	Total	8,000	3,000	.....	.....	.....	.....	.....
Detroit, Mich	Steam	120,000	.....	.....	.....	50,000	.....	50,000
Holland, Mich	Steam	31,500	11,500	.....	.....	.....	.....	.....
Lansing, Mich	Hydro	1,200	.....	.....	.....	.....	.....	.....
	Steam	139,250	.....	44,000	.....	.....	.....	44,000
	Total	140,450	.....	44,000	.....	.....	.....	44,000
Lowell, Mich	Hydro	994	.....	.....	.....	.....	.....	.....
	IC	3,705	.....	1,000	.....	.....	.....	1,000
	Total	4,699	.....	1,000	.....	.....	.....	1,000
Sebewaing, Mich	IC	2,903	1,136	.....	.....	.....	.....	.....
South Haven, Mich	Steam	10,000	.....	.....	7,500	.....	.....	7,500
Wyandotte, Mich	Steam	25,000	.....	.....	.....	20,000	.....	20,000
Albin, Mich	IC	3,006	1,245	.....	.....	.....	.....	.....
Bemesville, Minn	IC	970	.....	700	.....	.....	.....	700
Elk River, Minn	Hydro	230	.....	.....	.....	.....	.....	.....
	IC	1,100	.....	1,500	.....	.....	.....	1,500
	Total	1,330	.....	1,500	.....	.....	.....	1,500
Fairmont, Minn	Steam	12,000	.....	.....	.....	7,500	7,500	15,000
Le Sueur, Minn	IC	1,350	.....	.....	.....	1,350	.....	1,350
New Prague, Minn	Steam	1,000	.....	.....	.....	.....	2,000	2,000
	IC	2,500	.....	.....	.....	.....	.....	.....
	Total	3,500	.....	.....	.....	.....	2,000	2,000
New Ulm, Minn	Steam	9,750	.....	.....	.....	7,500	.....	7,500
Rochester, Minn	Hydro	1,140	.....	.....	.....	.....	.....	.....
	Steam	31,500	11,500	.....	.....	.....	.....	.....
	Total	33,340	11,500	.....	.....	.....	.....	.....
Sleepy Eye, Minn	Steam	3,200	.....	.....	.....	.....	2,500	2,500
	IC	625	.....	.....	.....	.....	.....	.....
	Total	3,825	.....	.....	.....	.....	2,500	2,500
Virginia, Minn	Steam	10,000	.....	9,375	.....	.....	.....	9,375
Wells, Minn	IC	3,891	1,360	.....	.....	.....	1,360	1,360
Willmar, Minn	Steam	7,750	.....	.....	7,500	.....	.....	7,500
Greenwood, Miss	Steam	22,000	.....	.....	10,000	.....	.....	10,000
Carthage, Mo	IC	3,000	.....	.....	.....	5,000	.....	5,000
Chillicothe, Mo	Steam	9,000	.....	.....	.....	.....	10,000	10,000
Columbia, Mo	Steam	18,500	.....	.....	.....	15,000	15,000	30,000
Fulton, Mo	Steam	6,125	.....	.....	.....	6,000	.....	6,000
David City, Neb	Steam	750	.....	.....	.....	.....	.....	.....
	IC	1,000	.....	1,000	.....	.....	.....	1,000
	Total	1,750	.....	1,000	.....	.....	.....	1,000
Fairbury, Neb	Steam	8,500	.....	.....	.....	.....	7,500	7,500
Grand Island, Neb	Steam	17,500	9,375	.....	.....	15,000	.....	15,000
Wayne, Neb	IC	3,230	.....	.....	.....	.....	1,500	1,500
West Point, Neb	IC	2,135	.....	.....	630	.....	.....	630
Wisner, Neb	IC	.....	.....	600	.....	.....	.....	600
Vineland, N. J	Steam	23,500	.....	.....	12,500	.....	.....	12,500
Bryan, Ohio	IC	6,750	.....	.....	.....	.....	3,000	3,000

Municipal Systems	Prime Mover	Capacity End 1953	1953	1954	1955	1956	After 1956	Total Additions Now Planned
Dover, Ohio	Steam	8,410	.....	7,500	.....	.....	.....	7,500
Napoleon, Ohio	Steam	5,000	.....	.....	.....	5,000	.....	5,000
Orrville, Ohio	Steam	9,750	.....	7,500	.....	.....	7,500	15,000
Painesville, Ohio	Steam	15,500	.....	7,500	.....	.....	.....	7,500
Piqua, Ohio	Steam	33,000	.....	.....	.....	.....	10,000	10,000
Fairview, Okla.	IC	1,550	.....	350	.....	.....	800	1,150
Marlow, Okla.	IC	1,620	.....	.....	.....	1,200	.....	1,200
Stillwater, Okla.	Steam	8,000	.....	.....	6,000	.....	.....	6,000
Chambersburg, Pa.	Steam	11,000	.....	.....	.....	4,000	.....	4,000
Quakertown, Pa.	Steam	6,000	.....	.....	.....	.....	.....	.....
	IC	.....	.....	1,100	.....	1,500	.....	2,600
	Total	6,000	.....	1,100	.....	1,500	.....	2,600
Sioux Falls, S. D.	IC	.....	.....	.....	2,000	.....	.....	2,000
Watertown, S. D.	Steam	8,000	.....	.....	.....	7,500	.....	7,500
Austin, Tex.	Steam	66,000	.....	.....	22,000	22,000	66,000	110,000
Coleman, Tex.	Steam	2,600	.....	.....	.....	.....	.....	.....
	IC	1,250	.....	1,250	1,250	.....	.....	2,500
	Total	3,850	.....	1,250	1,250	.....	.....	2,500
Lubbock, Tex.	Steam	30,500	12,600	.....	.....	23,000	.....	23,000
	IC	14,150	.....	.....	.....	.....	.....	.....
	Total	44,650	12,600	.....	.....	23,000	.....	23,000
San Antonio, Tex.	Steam	203,500	60,000	60,000	.....	100,000	.....	160,000
anticello, Utah	IC	300	.....	.....	300	.....	.....	300
Danville, Va.	Hydro	10,125	.....	.....	.....	.....	.....	.....
	Steam	29,000	11,500	.....	.....	.....	.....	.....
	Total	39,125	11,500	.....	.....	.....	.....	.....
Seattle, Wash.	Hydro	551,656	200,000	.....	.....	.....	150,000	150,000
	Steam	53,000	.....	.....	.....	.....	.....	.....
	Total	604,656	200,000	.....	.....	.....	150,000	150,000
Tacoma, Wash.	Hydro	238,000	.....	.....	.....	.....	460,000	460,000
	Steam	34,000	.....	20,000	.....	.....	.....	20,000
	Total	272,000	.....	20,000	.....	.....	460,000	480,000
Kaukauna, Wis.	Hydro	16,100	.....	.....	.....	.....	.....	.....
	Steam	3,500	3,500	.....	.....	.....	.....	.....
	Total	19,600	3,500	.....	.....	.....	.....	.....
Menasha, Wis.	Steam	8,000	.....	.....	.....	7,500	.....	7,500
	IC	1,600	.....	.....	.....	.....	.....	.....
	Total	9,600	.....	.....	.....	7,500	.....	7,500
Consumers Public Power Dist.	Hydro	9,115	.....	.....	.....	.....	.....	.....
	Steam	15,750	.....	.....	7,500	.....	.....	7,500
	IC	18,290	.....	.....	.....	.....	.....	.....
	Total	43,155	.....	.....	7,500	.....	.....	7,500
Imperial Irrigation District	Hydro	99,276	9,600	.....	.....	33,000	.....	33,000
Modesto Irrigation District	Hydro	11,000	.....	.....	.....	.....	25,000	25,000
N. Y. Power Authority	Hydro	.....	.....	.....	.....	2,240,500	.....	2,240,500
Turlock Irrigation District	Hydro	28,000	.....	.....	.....	.....	80,000	80,000
Municipal State & Power District Systems	**Hydro**	**1,709,336**	**247,100**	.....	.....	**2,273,500**	**715,000**	**2,988,100**
	Steam	**2,489,935**	**340,975**	**702,375**	**297,500**	**347,500**	**310,000**	**1,647,375**
	IC	**111,403**	**5,953**	**11,690**	**10,177**	**12,750**	**12,260**	**54,877**
	Total	**4,310,674**	**594,028**	**714,065**	**305,677**	**2,633,750**	**1,037,260**	**4,690,752**
Cooperatives								
Border Counties	Hydro	600	.....	600	.....	.....	.....	600
	IC	4,843	.....	.....	1,000	.....	1,000	2,000
	Total	5,443	.....	600	1,000	.....	1,000	2,600
Brazos	Steam	23,000	.....	.....	.....	18,000	36,000	54,000
Central Kansas	IC	4,320	.....	6,200	.....	3,100	.....	9,300
Corn Belt	Steam	41,500	16,500	.....	.....	.....	30,000	30,000
	IC	25,550	.....	.....	.....	.....	.....	.....
	Total	67,050	16,500	.....	.....	.....	30,000	30,000
Dairyland	Hydro	21,900	.....	.....	.....	.....	.....	.....
	Steam	130,000	35,000	.....	50,000	.....	.....	50,000
	IC	14,200	.....	.....	.....	.....	.....	.....
	Total	166,100	35,000	.....	50,000	.....	.....	50,000
Northeast Missouri	Steam	15,000	15,000	.....	.....	18,750	.....	18,750
	IC	7,440	.....	.....	.....	.....	.....	.....
	Total	22,440	15,000	.....	.....	18,750	.....	18,750
Northern Michigan	Steam	21,049	15,000	.....	.....	7,500	.....	7,500
Pioneer	IC	3,750	.....	1,345	.....	.....	.....	1,345
Western Minnesota	IC	.....	.....	.....	.....	1,300	.....	1,300
Wheatland	IC	11,098	2,345	4,690	.....	.....	.....	4,690
Cooperatives	**Hydro**	**22,500**	.....	**600**	.....	.....	.....	**600**
	Steam	**230,549**	**81,500**	.....	**50,000**	**44,250**	**66,000**	**160,250**
	IC	**71,195**	**2,345**	**13,235**	**1,000**	**4,400**	**1,000**	**18,635**
	Total	**324,244**	**83,845**	**13,835**	**51,000**	**48,650**	**67,000**	**179,485**

Source: "Electrical World" Survey. Unless otherwise noted, year end 1953 capacity is reported on nameplate, additions are reported as maximum rated capability. *Year end maximum rated capability.

General Electric announces
transformers, regulators, capacitors with

SUPER MELAGLYP

a new outdoor finish with up to 150% longer life

GENERAL ELECTRIC

for further details see next page ▶

New G-E Super Melaglyp finish adds years

POWER TRANSFORMER

While flat surfaces may be spray-painted, all tubular surfaces are flow-painted

UNIT SUBSTATION

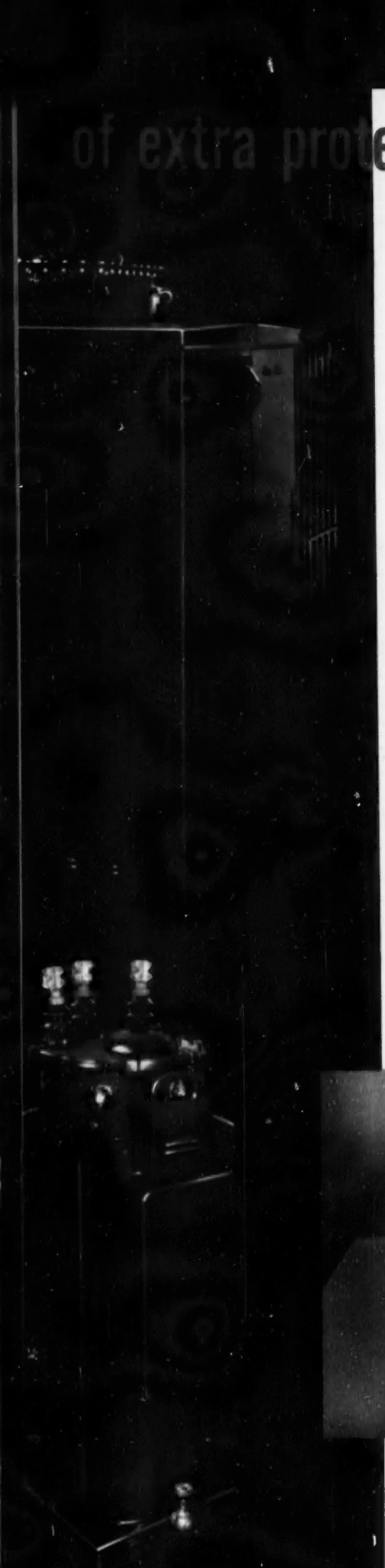
Substation

OIL FUSE CUTOUT

Conventional | Unit-type

DISTRIBUTION TRANSFORMERS

# of extra protection to outdoor equipment



VOLTAGE REGULATOR

New finish averages 50% longer life than previous finish . . up to 150% longer in corrosive locations; saves money by cutting repainting costs

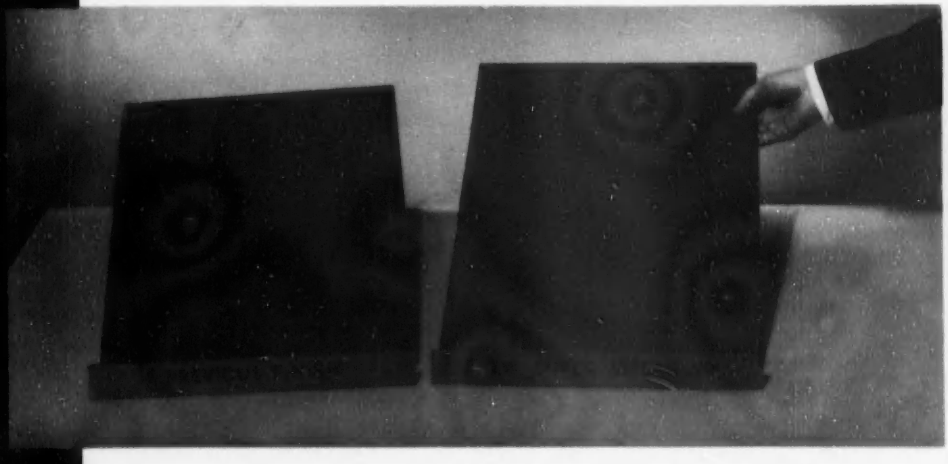
All of the General Electric distribution apparatus shown on these pages is now finished with Super Melaglyp, a new outdoor paint finish developed in G-E research laboratories. By actual tests, this new finish has an average life 50% longer than the previous finish used. This longer paint life means that you save one, perhaps two, repaintings. (At an average repainting cost, for example, of $15 per distribution transformer, that's real economy.)

WHERE PAINT LIFE COUNTS THE MOST — in areas where corrosive industrial "smog" and other chemical fumes literally eat an ordinary finish down to the base metal — Super Melaglyp will cut your repainting bill even more dramatically. Laboratory tests show that in such corrosive atmospheres *the new Super Melaglyp will give you up to 150% longer paint life than the best finish previously known to us.*

WE BELIEVE that Super Melaglyp is by far the best outdoor finish available today for distribution and power apparatus. It's another example of the extra values you get by specifying G-E equipment. General Electric Company, Schenectady 5, New York.

Progress is our most important product

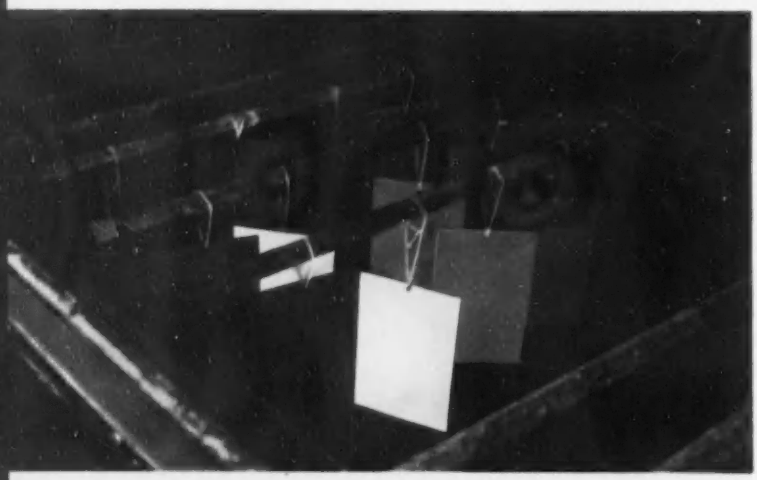
GENERAL ELECTRIC

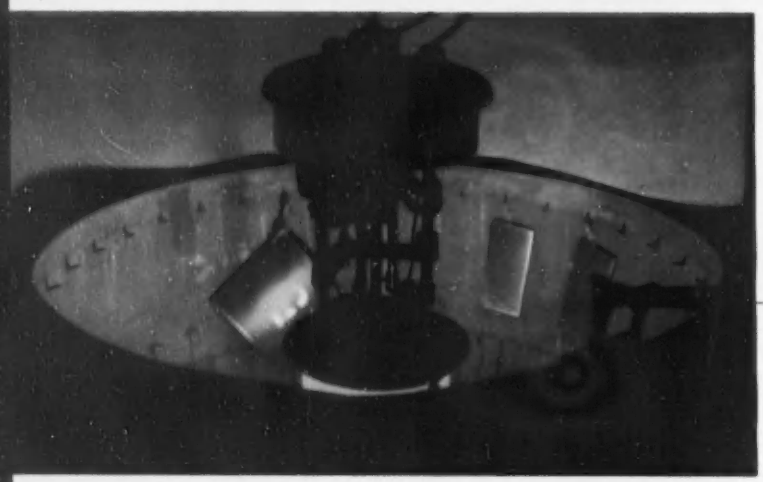


SALT-SPRAY TEST PROVES SUPERIORITY OF NEW FINISH

After 855 hours in an accelerated salt-spray test, G.E.'s new Super Melaglyp (right) is just as good as new . . . although the previous finish (left) has started to show signs of weathering.

SUPER MELAGLYP—a product of G-E research—proved superior by 1400-hour salt-spray and 17,000-hour Weather-Ometer tests





Super Melaglyp was developed in General Electric research laboratories after more than 4 years of experimentation.

The upper picture shows panels painted with Super Melaglyp in the salt-spray "box" at G.E.'s Materials and Processes Laboratory in Pittsfield, Massachusetts. Super Melaglyp lasts for over 1,400 hours in this rugged accelerated test compared with an average life of only 700 hours for the best paint finish previously known to us. This indicates that Super Melaglyp has unusually long life in salt and corrosive atmospheres.

The lower picture shows several panels finished with Super Melaglyp in a "Weather-Ometer," which simulates natural weathering by alternately exposing the paint samples to ultra-violet light, water spray, and to heat and cold. Super Melaglyp passed this test with the highest rating ever given to any apparatus paint finish.

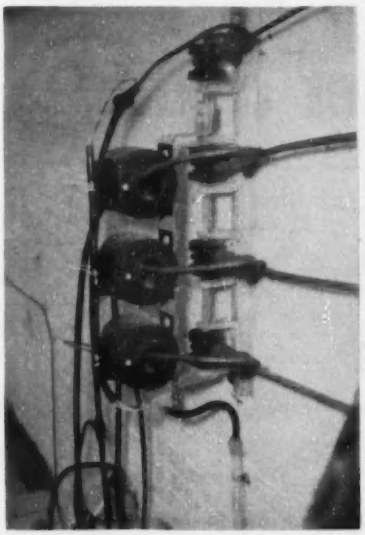
Below is a tabulation showing how Super Melaglyp stands up in a wide range of laboratory tests, and how it surpasses the best paint finish previously known to us. 431-13

Here's how new Super Melaglyp compares with previous finish

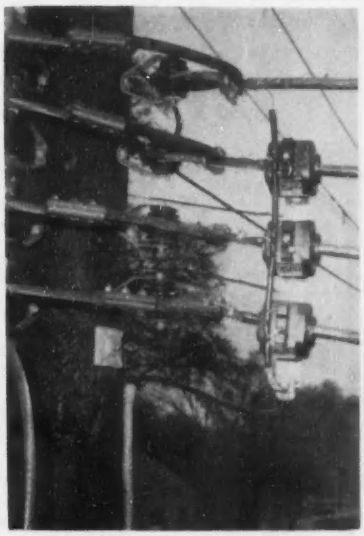
	Previous finish	New Super Melaglyp
Film Continuity	100%	200%
Color Retention	100%	150%
Gloss	100%	130%
Gloss Retention	100%	150%
Water Resistance	100%	250%
Humidity Resistance	100%	250%
Salt-Spray Resistance	100%	200%
Ultraviolet Resistance	100%	250%
Chemical Resistance	100%	175%
Abrasion Resistance	100%	100%
Oil Resistance	100%	100%
Appearance	100%	125%

Progress is our most important product

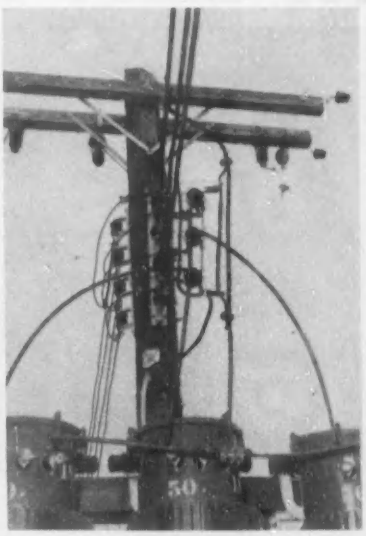
GENERAL ELECTRIC



RACK MOUNTED CT bracket saved customer $300 by branching mains at meter



CONDUCTOR SUPPORTED CT's can be located at the service take-off from a pole



GROUNDED RISER SUPPORT for bracket can be applied easily to existing construction

Outdoor Metering Installations Cut Costs

C. E. SLOOP, Division Meter Superintendent, Georgia Power Co, Columbus, Ga.

Outdoor methods of installing window-type current transformers for metering low-voltage overhead services save installation costs and space for both customer and utility. They also save the utility considerable energy loss from the location of current transformers to usual point of indoor metering. The methods are made possible by a new CT bracket and apply to services of less than 300 v to ground and upward from 200 amp.

The first method covers metering on the outside of a customer's building wall or on poles where current transformers are located at secondary wire racks. In both cases, the CT bracket is attached to the secondary rack, as illustrated, and current transformers are mounted on the bracket. An 8-conductor cable connects potential and current circuits to the metering installation.

The second method applies where service conductors to be metered support the current transformers at the pole. This is done usually at platform structures where conductors of 500,000 cir mils and larger are difficult to bend. Current transformers are placed 18-in. away from the pole and are spaced uniformly by a CT bracket. The bracket is anchored to the pole or to the neutral service wire to prevent transformers from moving away.

Another method of installing current transformers at the pole is to fasten the bracket to the secondary neutral riser, as illustrated. Current transformers are mounted on the bracket, and "hot" secondary risers are run through the CT's and then tapped to the service. This method can be applied readily to existing construction without major changes.

Manhours for installing these metering installations are at a minimum. Wiring meter box and transformer connections on CT brackets may be made in the shop as required. The utility crew may complete its entire job at the desired time rather than the time determined by contractor's work schedule even though the customer's mains are not yet brought out or installed.

Metering outside saves entering customer's buildings for reading and testing meters, which often get behind locked doors. It also saves the utility negotiating with customers, architects, and contractors for often valuable inside wall space for metering. Contractors do not have to coordinate essential wire construction with indoor meter equipment. In addition, outside metering often saves the customer the cost of totaling all service through one heavy set of mains, permitting services to branch out from the meter in a more economical manner.

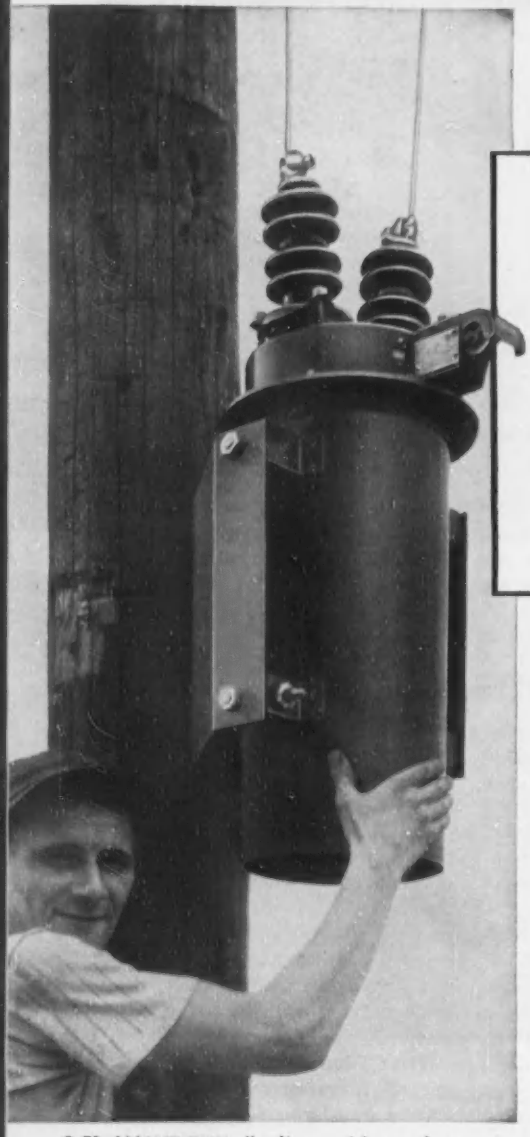
The CT bracket suitable for mounting all manufacturer's window-type current transformers is manufactured by an Atlanta company under patent rights.

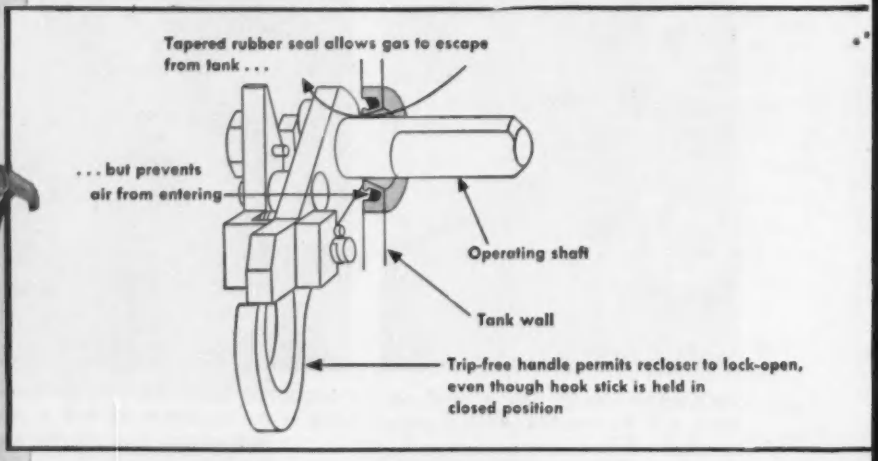
Crane Trailer Unit Loads and Sets Poles

W. E. HOOPER, General Manager, City Power, Water & Gas Dept, Sheffield, Ala.

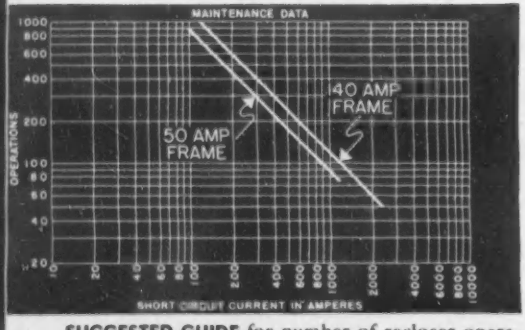
For fast and convenient loading and unloading of poles, an arrangement consisting of a Hydra-Lift and pole trailer has proven quite effective. Poles of 35 and 40-ft lengths are easily handled with a two-man crew. Longer ones are handled with butt

"No more recloser maintenance for another 3 years!"




Tapered rubber seal allows gas to escape from tank . . .
. . . but prevents air from entering
Operating shaft
Tank wall
Trip-free handle permits recloser to lock-open, even though hook stick is held in closed position

G-E's VALVE SEAL (in diagram) keeps dust, moisture from recloser, allows interruption gases to escape. Recloser maintenance is reduced two-thirds.



SUGGESTED GUIDE for number of recloser operations before inspection of 50- or 140-amp unit is based on conservative laboratory tests. With experience, time interval of 3 years may be extended later.

G-E exclusive "Sealed Unit" on Type FR Automatic Recloser permits longer inspection intervals

For the first time in the history of oil circuit reclosers, it is now possible—with General Electric's exclusive sealed unit Type FR Recloser—to schedule inspection and maintenance *only every 3 years.* Your maintenance is thus reduced to about one-third the amount considered normal for all reclosers.

GE's one-way valve seal around the operating handle shaft allows use of inhibited oil now being shipped with reclosers up to 140 amp frame size. With inhibited oil, reclosers should be inspected after the number of operations recommended on the curve in the graph at the left. In the majority of cases, the number of operations will be less than shown on the graph, and the recloser can be left in operation for the full 3 years.

With GE's new sealed unit FR reclosers, you get—

- **Exclusive valve seal that keeps out moisture and dust, yet permits interruption gases to escape.**
- **Minimum maintenance—reduced two-thirds.**
- **An available recloser design, completely interchangeable with other makes—plus top G-E quality and materials developed over a half century of manufacturing high-voltage breakers and reclosing devices.**

Sealed unit Type FR Automatic Reclosers come in single-phase FR-1 model and three-phase FR-3, continuous current of 5 to 140 amps, interrupting capacity of 125 to 2500 amps at 2400 to 14,400 volts. For details, write for bulletin, GEA-5961. General Electric Company, Schenectady 5, N. Y. 872-7

You can put your confidence in—

GENERAL ELECTRIC

SETTING POLE directly into hole after picking it up from trailer. Crane is mounted on 16,000-lb cab-over-engine truck

toward truck. In addition, the poles are picked up from the trailer and placed directly into holes when desired.

With the trailer and bolster removed the truck and crane are used to handle transformers and other material. One of the chief advantages is that the unit is used to load and unload itself. When used for this purpose the 8-ft flat bed can be extended to 12 ft by the addition of a 4-ft section. Transformers are lifted from the truck bed and placed directly on the transformer platform with a minimum of effort.

The crane is mounted on a 16,000-lb cab-over-engine truck. This truck is used because the shorter wheel base results in a more maneuverable vehicle. The 5-ton trailer is conventional except for its goose-neck tongue which connects to a bolster on the truck. This connection insures that there is freedom of movement of the trailer and poles around a common center.

Pole-Top Metering Installation

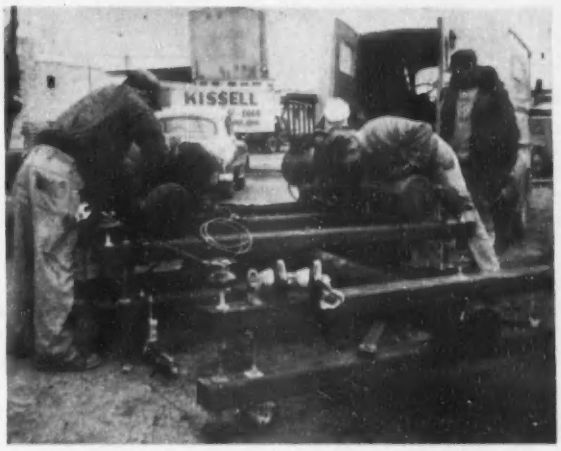
HAROLD GLICK, Meter Installer "A", Ohio Power Co, Lima, Ohio

Several advantages can be gained by installing primary metering equipment on the metering pole before it is set in place. The 3-wire polyphase installation shown was completed and erected with 24 man-hours, saving no less than this amount over customary pole-top installation.

Crossarms and braces, pin and dead-end insulators, current and potential transformers, cut-outs, risers, meter-control cable, and case and pole grounds were installed on the pole while it was in a horizontal position on the ground. To install oil-filled transformers in such a position they must be a non-syphon type and the lid gasket must be checked to avoid leakage.

Including both ground work and pole erection, the installation shown was done by a Class A groundman and meter installer, one 3rd Class lineman, two 1st Class linemen, and one line-working foreman in 4 hours. Pole was erected by holding it in proper balance by a truck-derrick and winch line.

Other advantages of attaching equipment to the pole while it is on the ground include:



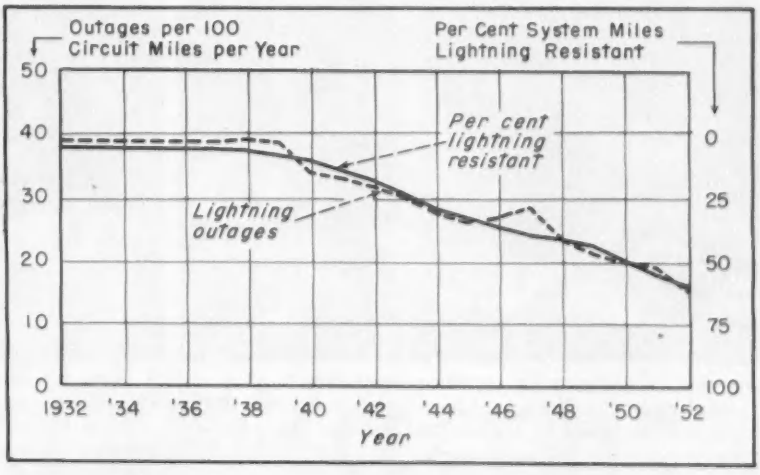
METERING EQUIPMENT INSTALLED on pole top before erecting pole saved 24 man-hours over that required when pole is set

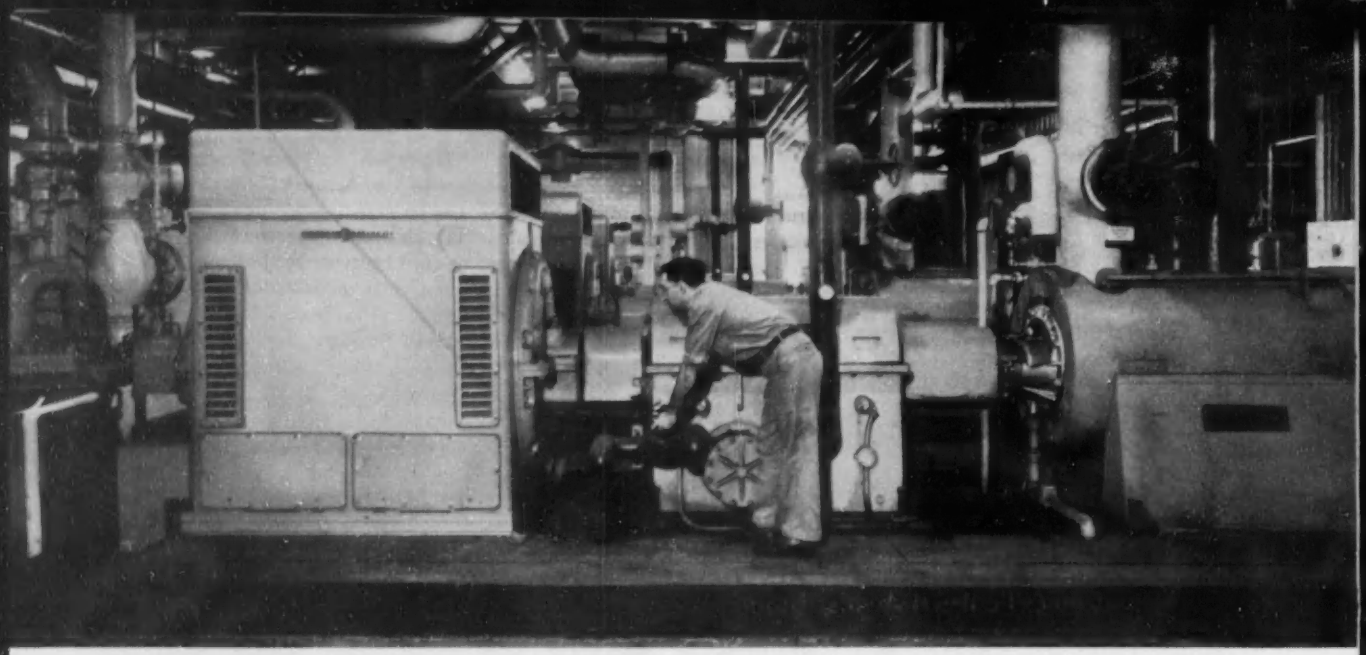
1. Men are less restricted in their operations and can work more readily than on an erect pole.
2. Meter installer can check the many connections before the installation is energized.
3. Young men can be given practical experience and become better acquainted with such installations.

Lightning Protection Cuts Outages

Transmission line performance on the Northern Indiana Public Service Co system has greatly improved since a program of shielding and grounding 34.5 and 69-kv wood-pole lines was initiated 15 years ago.

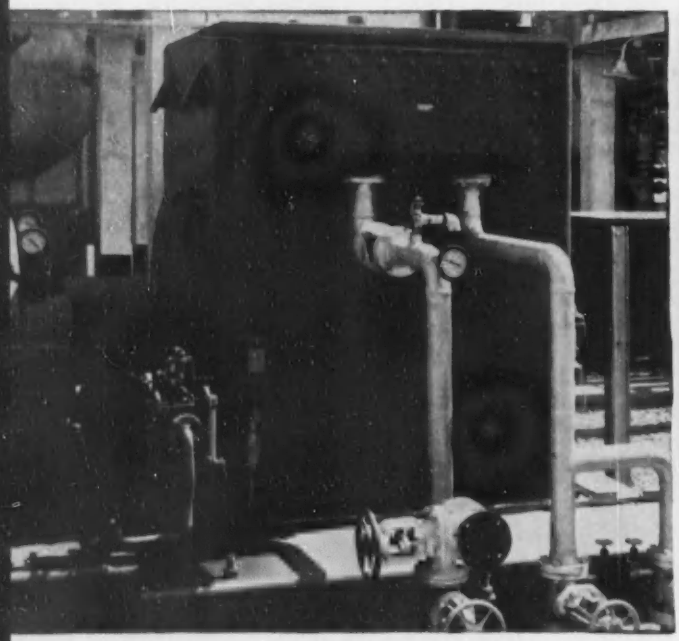
Since the program was initiated, there has been a nearly uniform increase in mileage of lightning resistant lines and a corresponding decrease in lightning outages per 100 circuit miles per year. Total number of outages has also decreased.



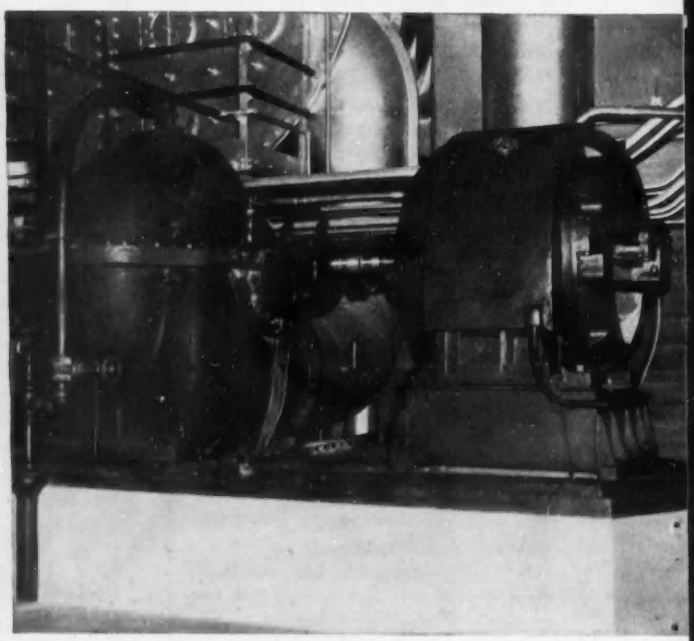


G-E BOILER FEED PUMP MOTORS in a typical application at Detroit Edison's Connor's Creek Plant. Designed especially for boiler feed pump service, 1000 hp ratings and larger, this motor permits closer spacing because of unique ventilating system and cubical shape . . . conserves floor space. You get improved performance from streamlined rotor design which also gives quieter operation. Dual lubrication system combines the advantages of force-flood lubrication and self-lubricated oil rings. Modern appearance blends with power station styling. Write for Bulletin GEA-5813.

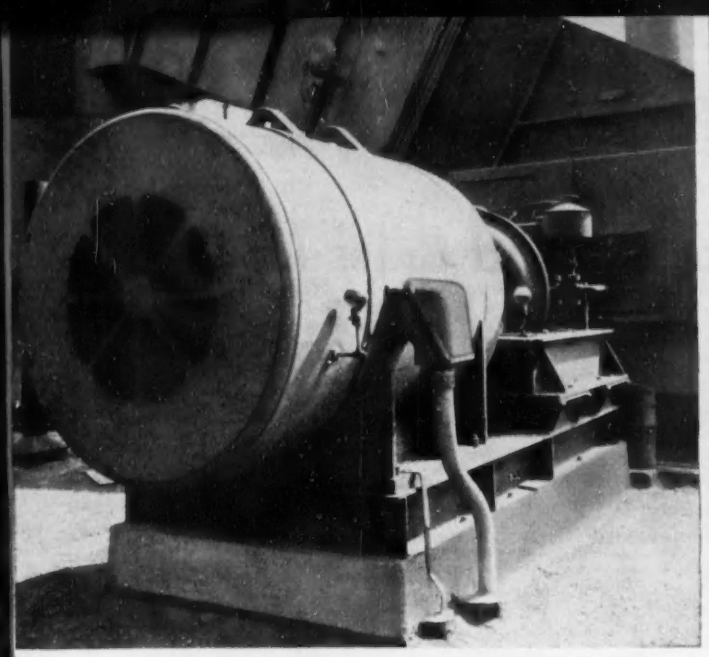
Proved Motor Dependability



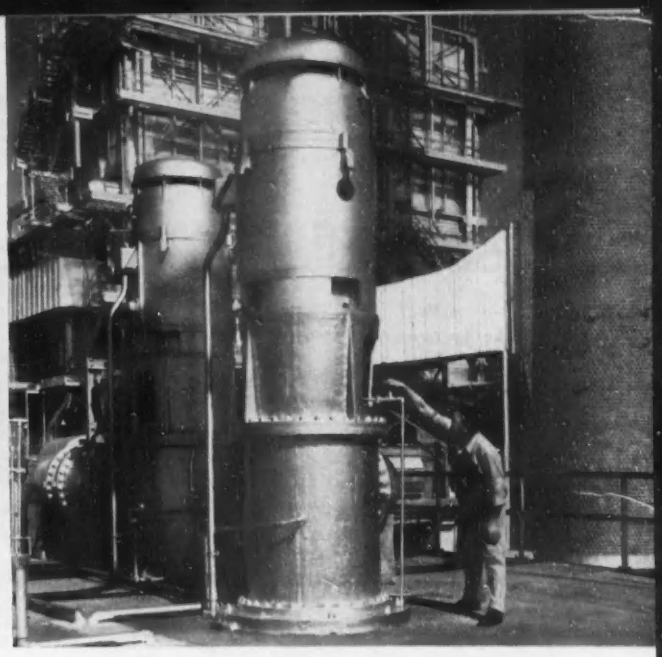
G-E TOTALLY ENCLOSED AIR-WATER COOLED MOTOR is an economical choice for 250 hp and larger. Simple to install, it needs no ducts, filters or blowers. Total enclosure means less maintenance by keeping out dust and other foreign particles. Shown here driving blower in a Kansas plant.



LARGE G-E OPEN DRIPPROOF MOTORS, four or more poles, such as this one coupled to circulating water pump in Cliffside Steam Station of Duke Power Company, are designed for indoor applications only. They are widely used on hot well pumps, forced- and induced-draft fans, and coal pulverizers.

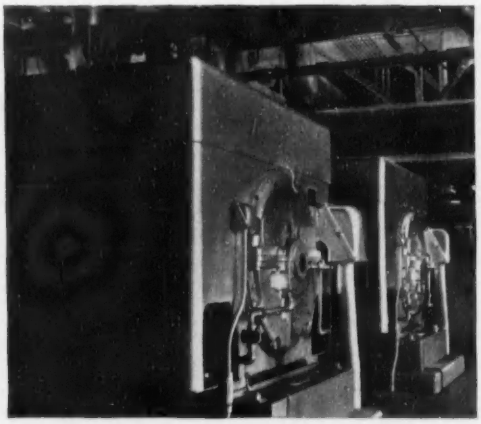


THIS G-E TOTALLY ENCLOSED FAN-COOLED MOTOR drives an induced-draft fan in the Edwardsport Steam-electric Power Station of Public Service Company of Indiana. Total enclosure assures the ultimate in motor protection required for operation in severe atmospheric conditions.



G-E VERTICAL TOTALLY ENCLOSED FAN-COOLED MOTORS, with Tri-Clad* construction, such as these driving pumps at New Orleans Public Service Inc., A. B. Paterson Steam-electric Generating Station, are used for dependable, low-maintenance service in severe ambient conditions.

for Power Station Service



TWO G-E WEATHER PROTECTED MOTORS, grade mounted, driving boiler feed pumps at Florida Power & Light Company's Cutler Plant. Available also in vertical and base ventilated design, this low-cost motor is designed especially for outdoor service where the extra protection of totally enclosed fan-cooled design is not economically justified. Bulletin GEA-5810.

*Reg. Trade-mark of General Electric Co.

G.E.'s complete line of power station auxiliary motors—field proved—assures you of getting the right motor for every operating requirement and station design.

Power stations across the country have installed dependable G-E motors for every auxiliary use. Because of the extensive field study that General Electric has devoted to power station requirements and the engineering experience gained through building all types of power station equipment for over 70 years, you are always assured of getting the right motor for economical and dependable service.

Whatever your needs in power station motors, General Electric can furnish the right type and size from a complete line . . . a wide variety of designs, enclosures, and application variations. You get exactly the motor needed to meet conditions of your operating practice, economics or location.

For more information on G.E.'s complete line of power station auxiliary motors contact your nearest G-E Apparatus Sales Office. *General Electric Co., Schenectady 5, N. Y.* 753-6

GENERAL ELECTRIC

Properties of Some Coppers and Brasses

Data furnished by Revere Copper Brass Inc

Alloy Name	Coppers[1] Electrolytic Tough Pitch	Coppers[1] Silver-bearing	Brasses[1] Muntz Metal	Brasses[1] Admiralty	Brasses[1] Aluminum Brass
Composition					
Copper	99.90[2]	99.90[2] (Silver 10 oz per ton min)	60.0	71.0	76.0
Zinc	.....	.....	40.0	28.0	22.0
Aluminum	.....	.....	.....	.....	2.0
Arsenic	.....	.....	.....	0.05	0.05
Tin	.....	.....	.....	1.0	.....
Silicon	.....	.....	.....	.....	.....
Typical Uses	Electrical conductors; bus bars, commutators, etc.	Electrical commutators	Condenser tubes and heads Valve stems, Brazing rods	Condenser and heat exchanger plates and tubes	Condenser and heat exchanger tubes
	Building products; roofing, gutters, etc.	Where retention of strength at moderately elevated temperatures is desired		Steam power plant equipment	Steam power plant equipment
	Process equipment; kettles, vats, distillery equipment			Chemical and process equipment	Chemical and process equipment
	Forgings			Marine uses Automobile aerials	Marine uses
General Properties	High electrical conductivity	10 oz. silver per ton added to increase annealing (softening) temperature	High strength combined with low ductility	Excellent corrosion resistance combined with strength and ductility	Excellent corrosion resistance combined with good strength and ductility
	High thermal conductivity				
	Excellent working ability	Resists softening at temperatures, from 400 to 800 F High conductivity			Better than Admiralty for resistance to velocity type of failure
Working Properties					
1. Cold-working	1. Excellent	1. Excellent	1. Fair	1. Good	1. Good
2. Hot-working	2. Excellent	2. Excellent	2. Excellent	2. Poor	2. Fair
3. Machining	3. Fair	3. Fair	3. Good	3. Fair	3. Poor
4. Welding	4. Deoxidized copper preferred[3]	4. Deoxidized copper preferred[3]	4. (Note 4)	4. Gas, carbon arc	4. .....
5. Soldering	5. Excellent	5. Excellent	5. Excellent	5. Good	5. Excellent
6. Polishing	6. Excellent	6. Excellent	6. Excellent	6. Good	6. .....
Density, lb per cu in	0.322	0.322	0.303	0.308	0.301
Young's Modulus of Elasticity, psi × 10⁻⁶	17	17	15	16	16
Coefficient of Thermal Expansion, per deg F (68 to 570 F)	0.0000098	0.0000098	0.0000116	0.0000112	0.0000103
Electrical Conductivity, % IACS at 68 F	100 min.	100 min.	28	25	23
Thermal Conductivity, Btu per sq ft per ft per hr per deg F at 68 F	226	227	71	64	58
Tensile Strength, 1000 psi	hard soft	hard soft	hard soft	hard soft	hard soft
sheet	50 32	52 33	80 54	90 50	.. ..
rod	48 32	.. ..	75 54	.. ..	.. ..
tube	55 32	.. ..	74 56	100 53	85 60
Elongation, % in 2 in.					
sheet	6 45	5 40	10 45	5 55	.. ..
rod	16 55	.. ..	20 50	.. ..	.. ..
tube	8 45	.. ..	10 50	3 65	10 55
Yield Strength, 1000 psi: 0.5% extension under load					
sheet	47 8	47 7	60 21	70 18	.. ..
rod	45 8	.. ..	55 21	.. ..	.. ..
tube	52 8	.. ..	55 23	80 22	60 27
0.2% offset					
sheet	47 8	47 7	66 21	76 18	.. ..
rod	45 8	.. ..	59 21	.. ..	.. 27
tube	52 8	.. ..	60 23	90 22	.. ..
Rockwell Hardness No.					
sheet	50B 40F	55B 40F	85B 80F	90B 25B	.. ..
rod	47B 40F	.. ..	80B 80F	.. ..	.. ..
tube	60B 40F	.. ..	80B 82F	95B 75F	86B 77F
ASTM Specifications					
sheet, strip	B11, B101, B152	B101, B152	.....	B171	.....
rod	B12, B48, B49, B124 B133, B187, R259 B188	B48, B49, B133, B187 B13, B98, B75, B88, B188	..... B111, B135	..... B111	..... B111
tube					

Basis of rating: sheet, hard—0.040 in. stock, previously rolled 4 B&S numbers hard (37.5% area reduction).
Basis of rating: copper rod, hard—1 (one) in. and under diameter, previously drawn through 25%–35% area reduction.
Basis of rating: brass rod, hard—1 (one) in. and under diameter, previously drawn through 20%–25% area reduction.

[1] The values listed above represent reasonable approximations suitable for general engineering use. Due to commercial variations in composition and to manufacturing limitations they should not be used for specification purposes. See applicable ASTM specification references.

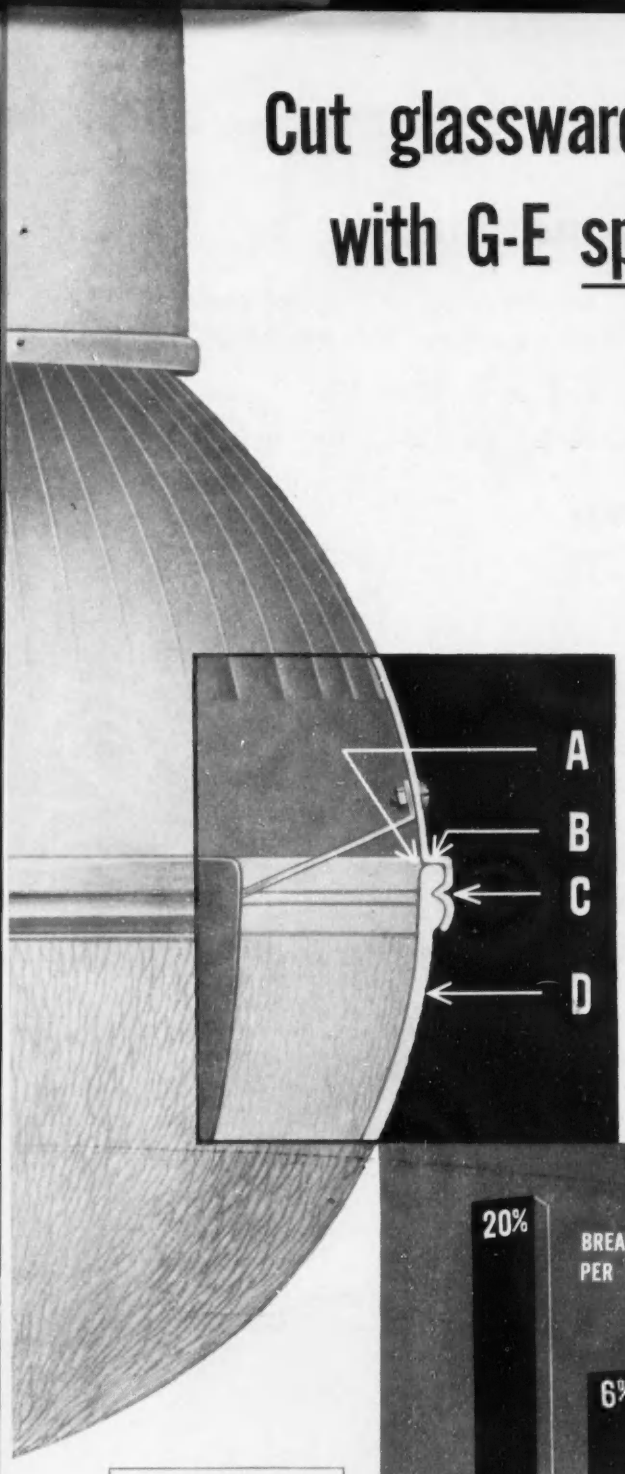
[2] By fusion methods: conductivity of the coppers makes resistance welding (spot and seam) impractical. Coppers, however, may be resistance brazed by a patented method.

[3] Minimum.

[4] Minimum.

[5] For welding—gas, carbon arc, metal arc, spot and seam welding for thin gauge.

Cut glassware breakage up to 80% with G-E spun-sealed luminaires



Replacing glassware for G-E spun-sealed street-lighting luminaires costs an average of 12 cents per luminaire **per year.** Compare that to replacement costs for ordinary glassware, in the comparison chart below, and you will see why G-E optical assemblies with the exclusive G-E spun-sealed design have brought amazing savings wherever they have been adopted.

In addition to greatly reduced glassware breakage—in service and in shipment—G-E spun-sealed assembly keeps glassware interiors clean for more efficient light utilization, and completely eliminates chipping of the refractor edge.

The economical, practical advantages of spun-sealed design are available on all standard G-E fixtures.

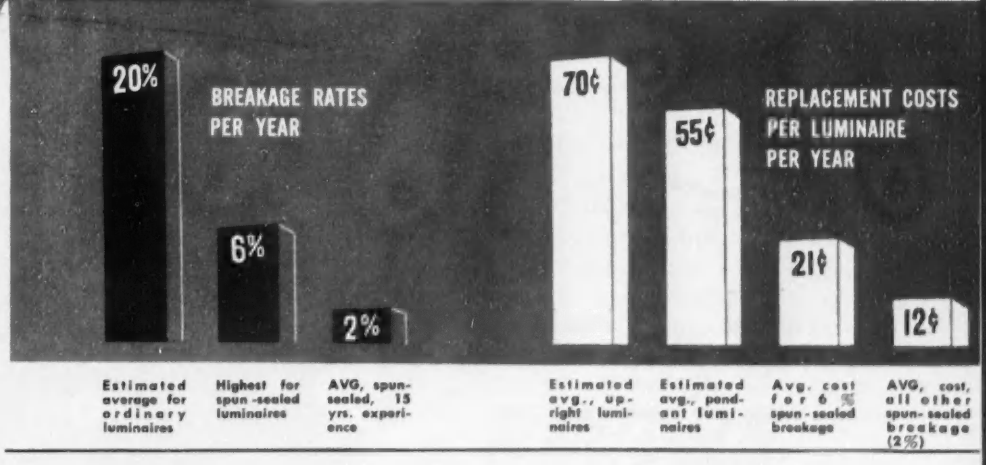
For more information on how you can benefit by using G-E spun-sealed optical assemblies, contact your nearby G-E Apparatus Sales Office, or Authorized G-E Street-lighting Agent. General Electric Company, Schenectady 5, N. Y. 452-138

A. No gasket at weatherproof joint reduces maintenance costs.

B. Reflector fully protects glassware lip from damage in shipping and storage.

C. Spinning operation weeds out any defective glassware at factory.

D. Pressed globes and refractors have exceptional strength and uniformity.



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GENERAL ELECTRIC

ENGINEERING REFERENCE SHEET

No. 54-2

Insulator Ties for Copper Conductors

Hand-wrapped and hot-line ties are illustrated for attachment of covered and bare conductors in circuits of 10 kv and higher. These methods are adapted from distribution standards of New England Electric System.

Hand-Wrapped Ties

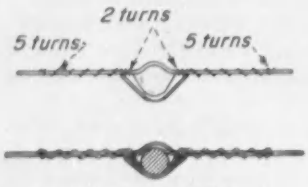


Fig. 1. Side groove, bridle tie

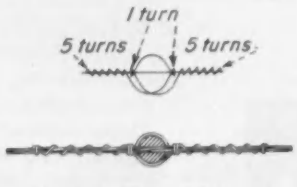


Fig. 2. Top groove, bridle tie

Final wraps are 5 turns, approximately 45 deg helix. For double insulators, ties as shown for single insulators are used with each tie occupying one-half available space between insulators—same number of turns with closer spacing.

Hot-Line Ties

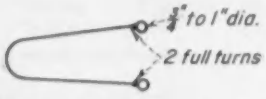


Fig. 3. Tie wire for hot-line ties

Soft drawn No. 4 solid copper wire is recommended for the insulator tie. Tie length is determined by size of insulator and conductor. Shape is as shown. Tie wire fits in insulator side groove and is wrapped to provide a bridle effect on the conductor. Both ends of wire are looped and located on top of conductor.

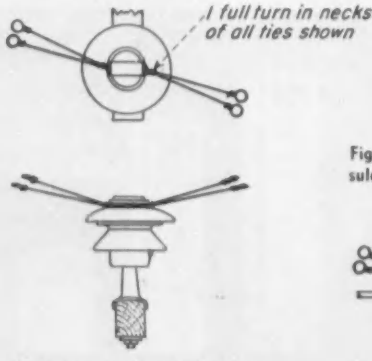


Fig. 4. Straight line tie in groove

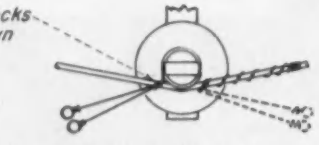


Fig. 5. Side tie on light angles; single insulator

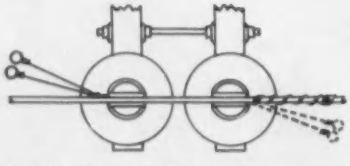
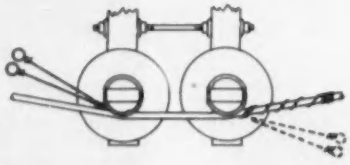


Fig. 6. Straight line tie in groove



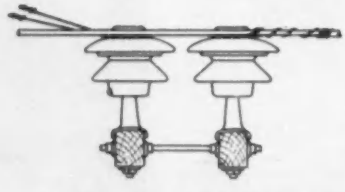
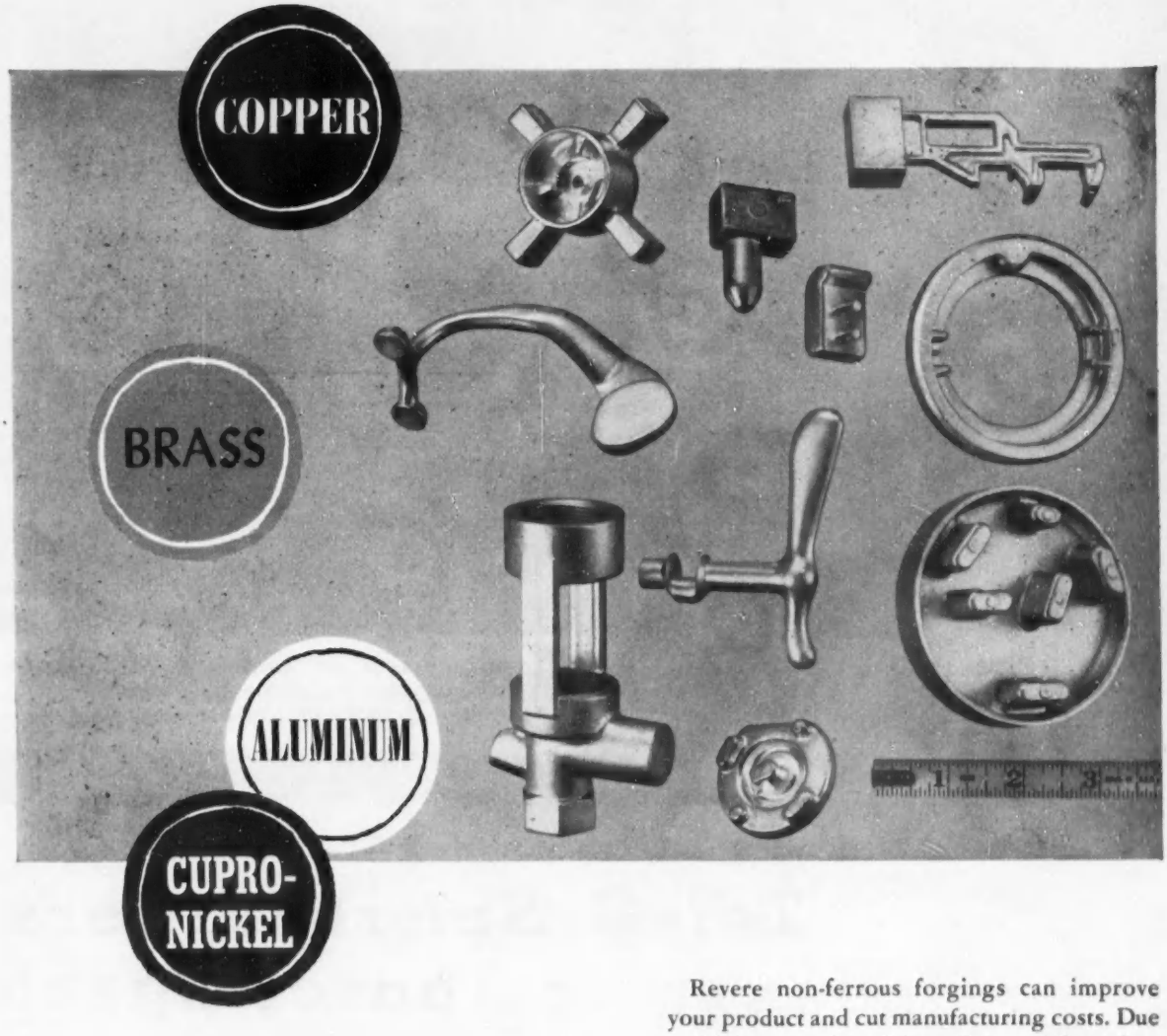


Fig. 7. Side tie on double arms

Notes: Fig. 4 shows two tie wires assembled on a single insulator preparatory to receiving the conductor and making a tie. Fig. 5 shows two tie wires on a single insulator with the conductor in place and preparatory to completing a side tie. Fig. 6 shows a single tie wire on each insulator for top ties on double arms. Fig. 7 shows a single tie wire on each insulator for side tie on double arms.

Both wires on one side of an insulator are turned in same direction and both wires on other side of the insulator are turned in opposite direction. They are started from the top and bottom of the conductor as in Fig. 5 and 7, or from opposite side of the conductor as in Fig. 4 and 6. This method provides a self-snubbing action to prevent the conductor from rolling and assist in holding it tightly against the insulator cap.



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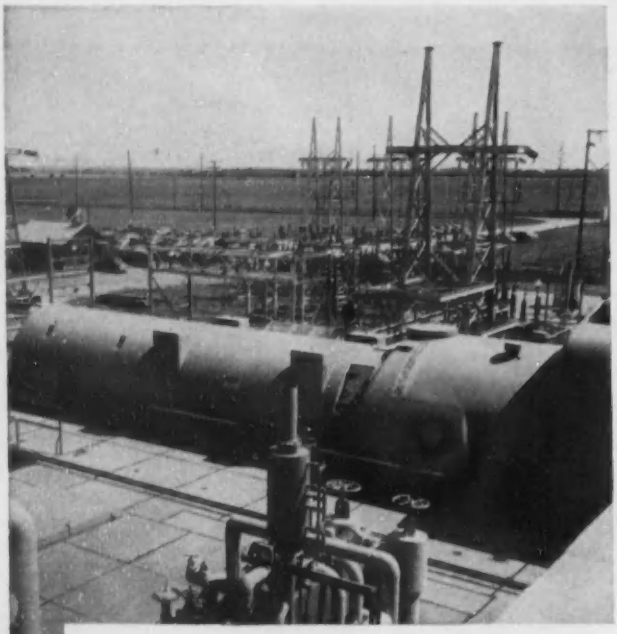
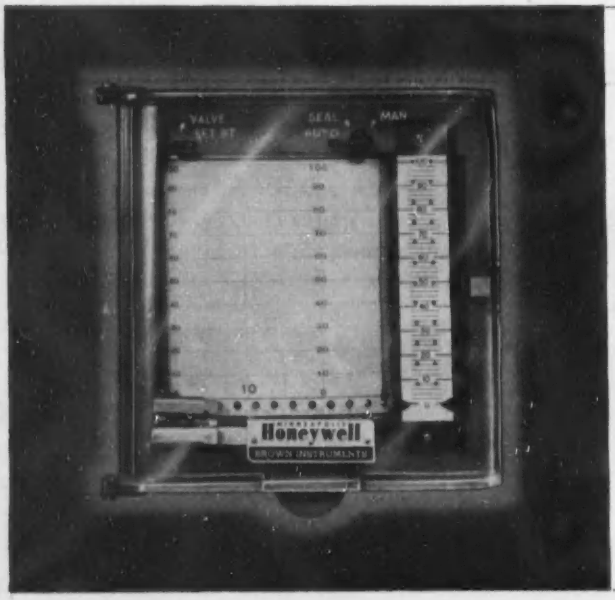


FUNCTIONAL DESIGN *is the keynote of the New Murray Gill Station designed by Ebasco for Kansas Gas & Electric Co. Above is an outdoor-mounted 47,000-kw generator unit.*

ON THE BACK OF THE CONTROL PANEL *are grouped full-size instruments such as these* **ElectroniK** *temperature recorders. But look on the operating side . . .*

Tel-O-Set recorders on compact



Every feature you need in a miniature recorder

Tel-O-Set recorders are applicable to measurements of temperature, pressure, flow and liquid level. They embody a simple, rugged pneumatic receiving system that is actuated by low-pressure air from the remote transmitter.

The recording chart moves horizontally. A full 8-hour record is quickly available.

The panel cutout required is only five inches square. In the mounted position, the instrument can be withdrawn from its case for easy inspection and adjustment.

...**THE FRONT OF THE PANEL,** *only eight feet in length per unit (two units shown), where operators can watch pertinent plant variables on miniature instruments mounted directly on a functional plant diagram.*

show critical trends graphic control panels

BOILER and turbine control panels, which used to stretch for dozens of feet along the sides of a central control room, are now being compressed into small, convenient size. The key to this new technique, pioneered by Ebasco in the power industry, is graphic instrumentation . . . which displays all vital operating variables on a plant diagram. Graphic panels bring complete plant operation into sharp focus . . . improve operator's efficiency . . . speed training of new men . . . and simplify start-up and emergency control.

For displaying the many variables which need more than instantaneous indication, *Tel-O-Set* miniature recorders are ideal on graphic panels. They take no more panel space than many dial indicators. And they provide a record which reveals trends, so that operators can know which way related variables are moving, and how fast.

When you're planning graphic instrumentation, plan to utilize *Tel-O-Set* recorders for these essential "trend indicators." Your nearby Honeywell sales engineer will be glad to discuss how they can be applied to your own control panels. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Aves., Philadelphia 44, Pa.

● **REFERENCE DATA: Write for new Bulletin No. 9050, "Instrumentation for Steam Generation."**

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

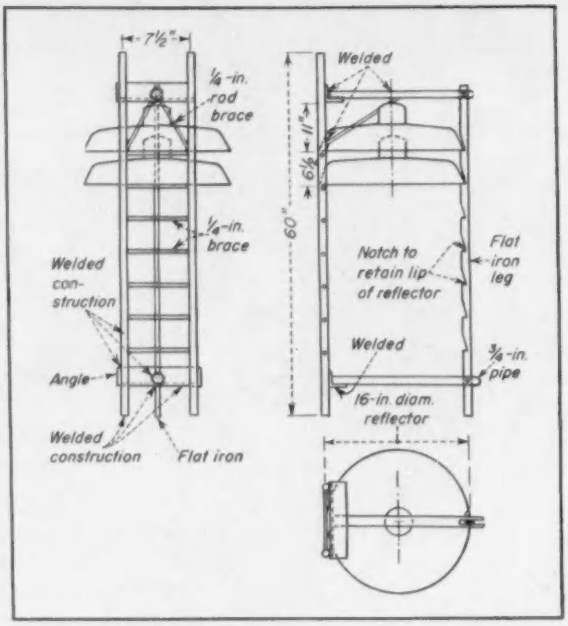
Rack Stores RLM Reflectors

P. B. BLIZZARD, Mechanical Engineer, Kanawha Valley Power Co, Charleston, W. Va.

A compact three-leg rack solved the problem of storing and handling a number of large RLM industrial-type reflector units used in illumination for maintenance, repair, and construction work. Because of their size (diameters in the order of 16 in.), storage and transportation of many units with their connecting cords may be quite a problem unless compact portable racks are used.

The rack illustrated, which is 5 ft high, will accommodate seven 16-in. reflectors with their connecting cords, and when filled will occupy less than 2 sq ft of floor area in the storage froom or on a truck. When empty the rack occupies less than 1 sq ft of floor area. Furthermore, when the rack is filled it may be readily carried in the horizontal position by two men. The connecting cords between units may be coiled on the domes of the reflectors as they are stacked in the rack.

When laid horizontally on the 2-leg side, one pin in the third leg may be removed to open that side and remove or replace the reflectors. The two pipe legs are extended to aid carrying the rack in a horizontal position.



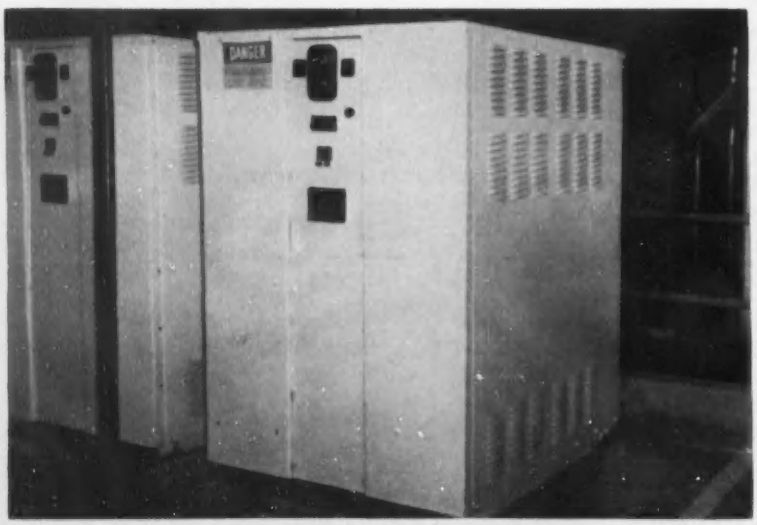
THREE-LEG RACK aids in storing and handling RLM reflectors

Packaged Unit Regulates Lighting Feeders

MELVIN G. LEWIS*, Buonaccorsi, Murray & Lewis, San Francisco, Calif.

A packaged unit to regulate voltage on only lighting feeders at Contra Steam Station has saved Pacific Gas & Electric Co a considerable amount of money in initial cost over the conventional practice of regulating all auxiliary feeders. Transformer-regulator units are conveniently located throughout the plant near load centers to feed all lighting circuits. Remaining power feeders operate unregulated directly from station service transformers. Over three years of operating experience has shown this system to be entirely satisfactory.

*Formerly chief electrical engineer, Bechtel Corp, Power Division, San Francisco



LIGHTING FEEDERS are supplied regulated voltage within ± 2 to 3% from packaged transformer-regulator unit. LRC equipment on station transformers is no longer needed

Packaged unit used at Contra Costa consists of a 112.5-kva, 480-120/208-v, three-phase dry-type transformer; a triplex, three-phase, dry-type, induction voltage regulator, and output feeder breakers as required for the particular location. Units are housed in a ventilated steel cabinet. Mounted on cabinet is a control panel for the voltage regulator. Voltage-regulating relays on each regulator are shock-mounted to resist effects of vibration.

One packaged unit can serve several lighting feeders. In addition, it has been found convenient to serve some fractional horsepower motors from the lighting circuits. Units installed at Contra Costa are designed to correct variations in input voltage as large as ± 10% and maintain constant output voltage within ± 1%. However, units are presently set to maintain output voltage within ± 2 to 3%. Voltage checks are made weekly.

Packaged units take their supply directly from auxiliary bus fed by station service transformers. Thus, they eliminate the need for load-ratio-control equipment on these transformers.

In early stages of Contra Costa's design, it was indicated that character-

(*Continued on page* 218)

Years Ahead

in Engineering and Design . . .
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Product of Holophane Engineering Research, No. 415 is presented as an altogether different lighting unit. Its efficiency, dependability and design are the result of long experience in developing prismatically-controlled lighting equipment for almost six decades.

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Asymmetric distribution spreads more light over the widest area . . . providing consistently high levels of illumination under all conditions . . .

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Die-cast aluminum hood and double thick prismatic refractor assure full protection against the elements. Easy to install, easy to maintain—it's trouble-free!

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Perfectly proportioned, attractively streamlined, No. 415 is adaptable to any modern exterior.

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- Garden Apartments
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- Entrances
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But, 55 years ago, when Alcoa started making aluminum accessories, there were none to copy. More than two million miles of transmission line depend on aluminum accessories today because of work we did. Thousands of heat runs at our research labs

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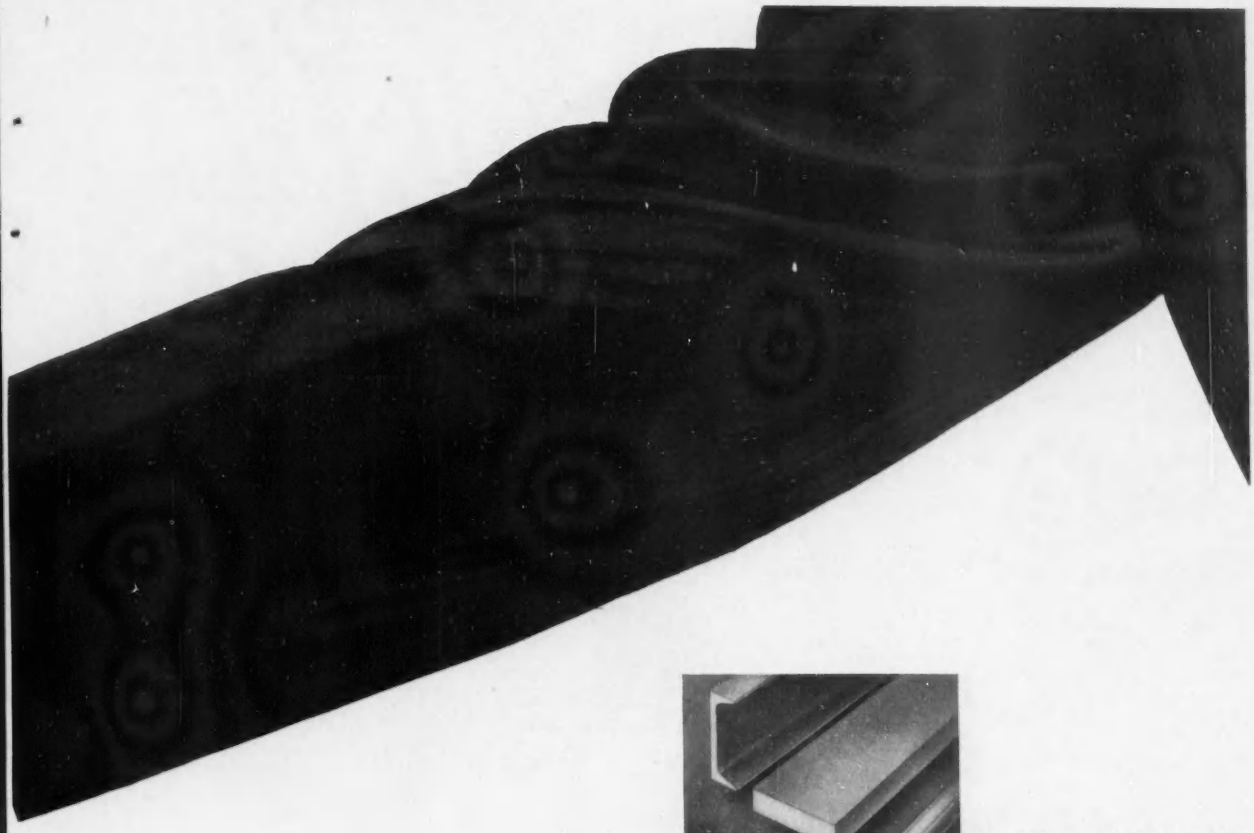
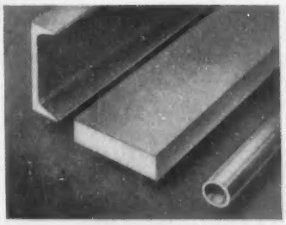
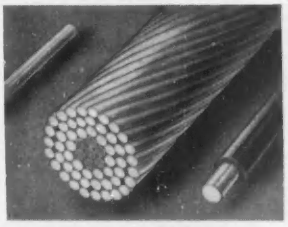


taught us the value of avoiding skimpy designs. Thousands of vibration tests at our physical testing labs taught us many basic design principles. Thousands of exposure tests on our own and customers' lines and at corrosion study centers taught us the importance of full recognition of the corrosion problem.

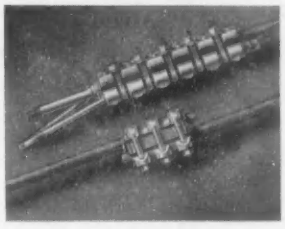
There is no substitute for Alcoa quality —you get just what you pay for. ALUMINUM COMPANY OF AMERICA, 2100-A Alcoa Building, Pittsburgh 19, Pennsylvania.



Alcoa® Aluminum Bus is available in rectangular and solid round bars, channels and tubular shapes.



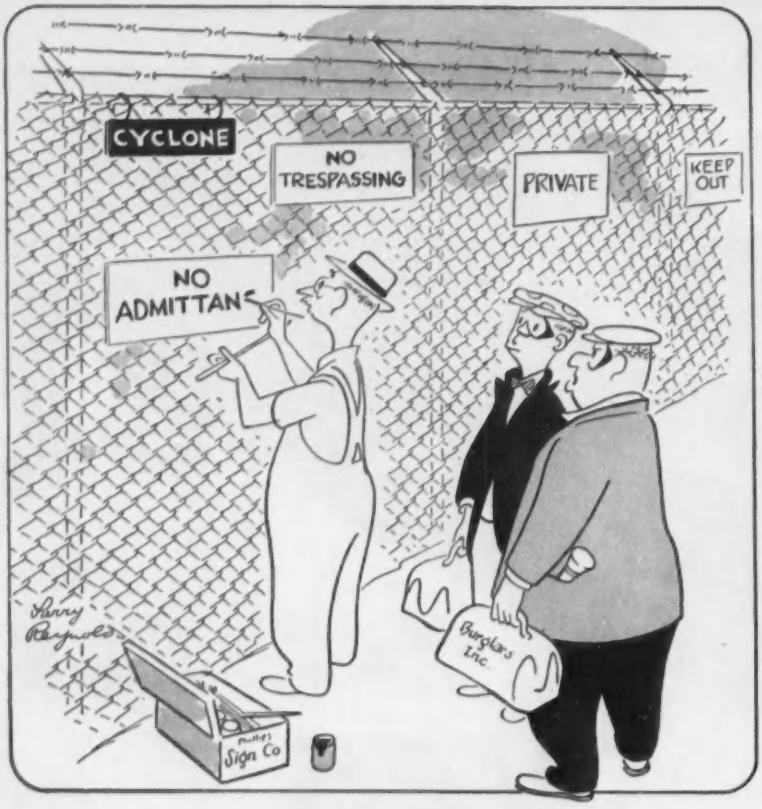
Alcoa Aluminum Electrical Conductors include ACSR, solid and stranded aluminum wire, bare or covered.



Alcoa's full line of aluminum accessories is correctly designed for use with all aluminum conductors.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA



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USS

UNITED STATES STEEL

Packaged Unit

(*Continued from page* 214)

istics of station auxiliary loads, except for lighting services, were such that close voltage regulation was not required. Therefore, LRC equipment for station service transformers could be eliminated by applying regulation to lighting feeders only. Idea of the packaged transformer-regulator was prompted by Bechtel engineers to reduce space requirements and to provide most economical arrangement for installation of necessary components.

Two Man-hours Saved In Cleaning Each Manhole

H. A. HALE

J. L. FERRIS

Substation Dept, Appalachian Electric Power Co, Roanoke, Va.

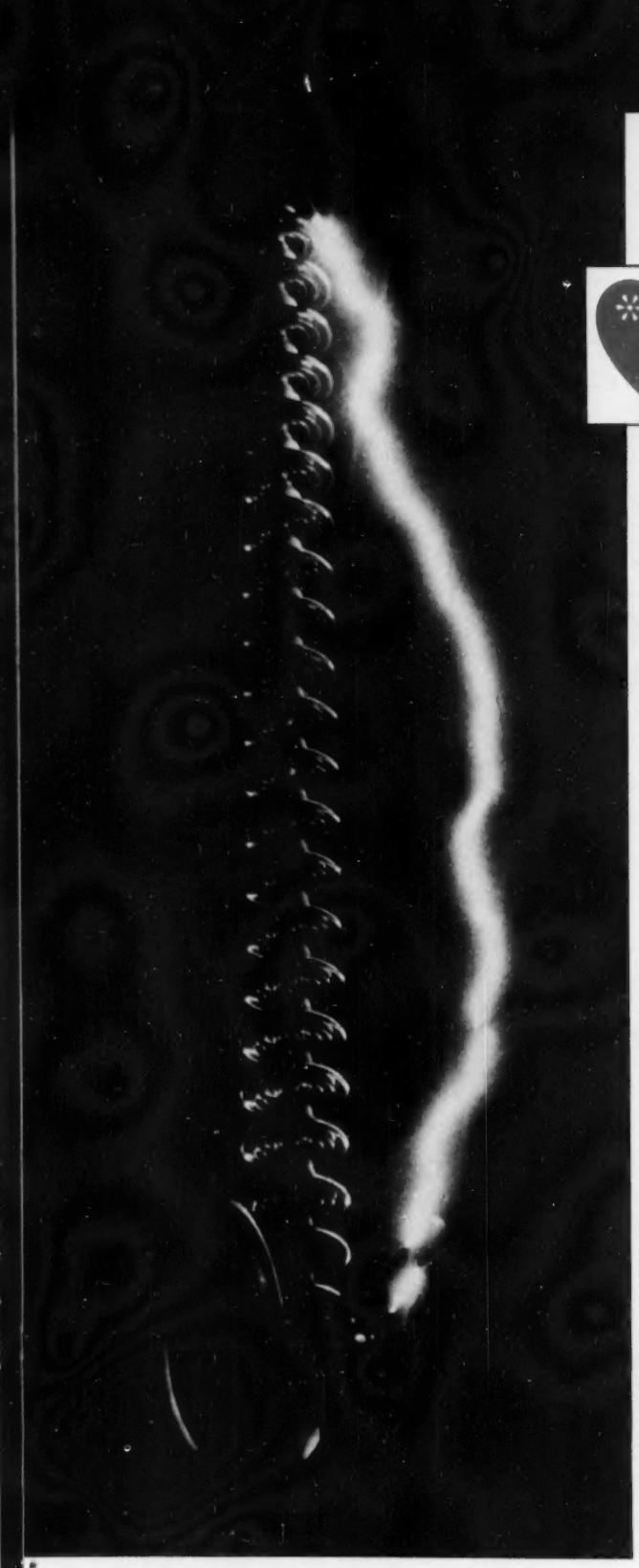
The jobs of pumping, cleaning, and flushing manholes and vaults have been combined into one operation with an estimated annual saving of 576 man-hours. In addition, a 300-gal water-tank trailer has been eliminated, thereby requiring less equipment maneuvering on heavy traffic streets. The operation was simplified by using

TIME SAVING is 2 man-hours in cleaning each manhole, by adding ¾-in. pressure tap and hose on discharge side of pump

a ¾-in. pressure tap on the discharge side of a pump to give approximately 18-psi water pressure.

The underground network system of the Roanoke district has 54 manholes and 30 transformer vaults, 80% of which are flooded several times each year by surface water. This

(*Continued on page* 223)



TC

Not a Test of Flashover . . . A Test of Attitude!

In early cooperative investigations of 330-kv transmission, we developed a corona shield to make possible, among other things, substantial economies through the use of conventional hardware. This naturally required accurate evaluation of the influence of this new shield on the impulse flashover of the insulator string.

Basically, this might seem quite a simple procedure. Applying the standard impulse wave to a string of insulators and hardware ten feet long took heavy testing equipment, to be sure, but was within the scope of several technical institutions. The important point in this was not so much a matter of equipment, but of attitude. Here was a combination of insulators *and* hardware, working together. Intelligent interpretation of test results likewise had to embrace this combination in order to arrive at a sound answer.

Here, the unique point-of-view of Ohio Brass became of special value. Men who habitually deal with the combination in all its phases -- design, manufacturing, and research -- have a keen appreciation for the interdependence of hardware and insulators, and customarily view the conductor support as starting at the cable and ending at the tower. Another interesting piece of investigation in this same category is described on the following pages. Association with products in this broad sense has its natural corollary in a broad-gauged approach to research.

While, from a standpoint of size and equipment, it is true that the O-B Laboratory stands far at the head in its branch of the Electrical Industry, these facilities must be combined with fine brains and a proper viewpoint to produce a truly sound research organization. Furthermore, it must be evident to the man who *invests* in transmission equipment instead of merely buying it, that insulators and hardware consist of more than mere porcelain, metal, and factory processes. This extra ingredient, supported by your purchases from O-B, is technical competence.

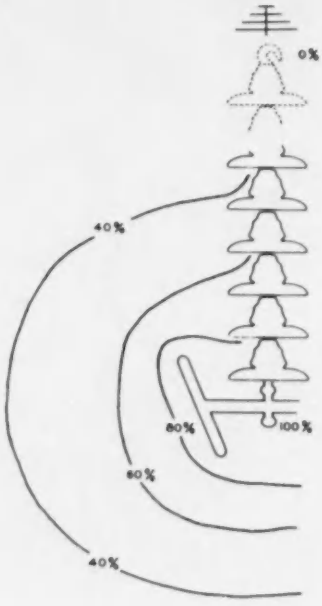
OHIO BRASS COMPANY, MANSFIELD, OHIO

In Canada—Canadian Ohio Brass Co., Lt'd., Niagara Falls, Ont.

TECHNICAL COMPETENCE

the heart of every Ohio Brass insulator

PORTRAIT



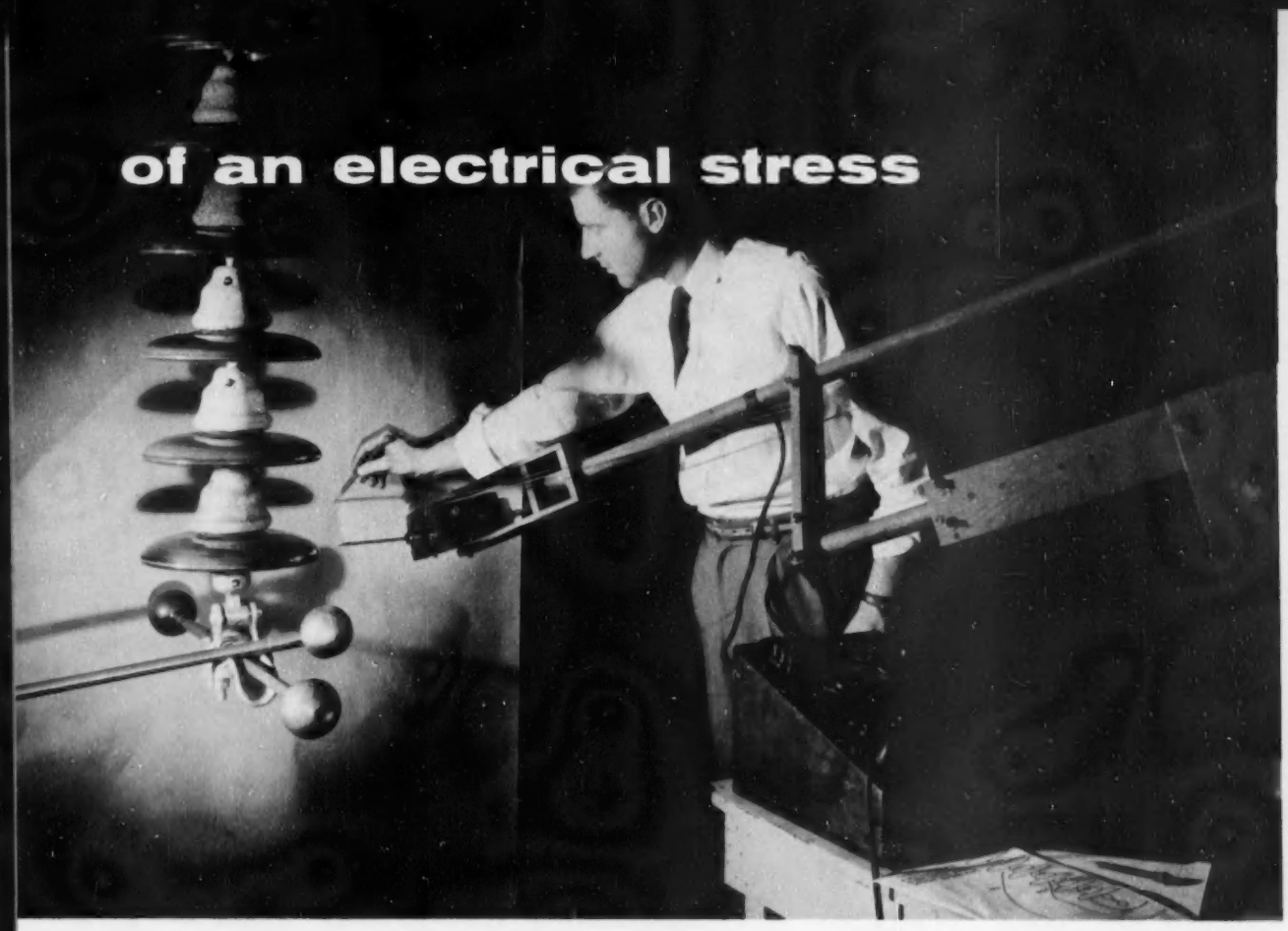
"Equi-Potential Map" of the electrostatic field surrounding the hardware and lower end of an insulator string intended for 330-kv operation. A clear means for visualizing stress concentrations permitted intelligent evaluation of a design of corona shield developed by O-B and permitting the use of economical, conventional suspension clamps.

Peace and Quiet— Courtesy of Buick

Duty-cycle testing on O-B Thorex lightning arresters sometimes blows the fuse on the high-voltage transformer. It's like firing off a shot-gun unexpectedly in the laboratory. Men working on some delicate apparatus might be startled, might smash some expensive equipment, might contact dangerous voltage -- to say nothing of shattered nerves.

-- So some "genius" hooked up a Buick muffler to the fuse. Now it's just a dull whoof!

This may have some actual good effect on O-B products by promoting un-disturbed contemplation on the part of research men, but one thing for sure -- the business of using your head is sort of a habit around the O-B Electrical Laboratory, and you can't predict where it may break out next.



What is the "shape" of the electrical field surrounding a string of insulators and hardware to operate at 330-kv, with and without a corona shield? Such questions are common in the O-B Electrical Laboratory. Accurate answers are also common, since technicians devised test equipment to chart an "Equi-Potential Map" of full-scale specimens.

Developed entirely within our own Laboratory, this device utilizes a sensitive probe, combined with delicate metering equipment, to determine the exact location of the intensity zone being sought. A spotlight throws a concentrated beam over the end of the probe and casts a sharp shadow on a paper chart in the background. These points are marked and joined by a continuous line, and you have your "Equi-Potential Map."

This research tool has enabled us to do advanced investigations of grading and electrostatic control for combinations of hardware and insulators. With it, one may visualize the "envelope" of any specific voltage concentration and study the effect of such devices as a new corona shield which we designed for 330-kv service.

It's all a part of that big extra helping of value that you never see in O-B insulators and hardware -- technical competence. It's one of the things that distinguished O-B in a market where the big difference isn't measured by raw materials or processes -- but by the finished product, by facilities, and by an attitude of management fostering technical advancement.

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Lt'd., Niagara Falls, Ont.

TECHNICAL COMPETENCE the heart of every *Ohio Brass* insulator

WHERE DO STANDARDS FIT INTO THE PICTURE OF VALUE?

Do Standards define the performance of a station insulator? By meeting a specification for size, strength, and a series of electrical tests *before ever going into service,* can you assume durability under extremes of climate, unexpected stresses, or lightning attack? Can the insulator's ultimate life be predicted?

Rigid as Standards can be set up, they still assure only two things: Physical interchangeability and a minimum level of manufacturing skill. Standards don't determine quality -- in fact they merely establish the point *beyond which* quality is measured, and *beyond which* your dollar's worth is computed! The real investment value of an insulator lies beyond Standards. And in this non-standardized area, where the sound bargains exist, every manufacturer is still strictly "on his own."

So -- What if this is true. Can O-B offer any valid claim for its station insulators that will appeal to an intelligent buyer? Consider this: for over 30 years, O-B has been one of the largest suppliers of insulators. Quantity and time have been compounded. The greatest opportunity has been presented for trouble to show up. And in the face of all this, our oldest and largest users are still our best customers. They have had plenty of chance to find out, on their own terms, the truth of the statement, "There's something more in the crate besides an insulator, when that crate bears the 'O-B' monogram."

That "something more" is the biggest dollar's worth you can get today in station insulators!

Ohio Brass

MANSFIELD OHIO • U. S. A.

IN CANADA—CANADIAN OHIO BRASS CO., LTD. • NIAGARA FALLS • ONT.

4407-H

Manhole Cleaning

(*Continued from page* 218)

situation poses a considerable routine housekeeping problem. Moreover, before any splicing, inspection, tests, or service connections are made in the underground system, the underground structures involved have to be pumped and cleaned.

Equipment for the cleaning operation consists of a 15,000-gph trailer-mounted pump driven by an internal-combustion engine. The pump discharge is a 3-in. GI nipple with 3-in. gate valve. The 3-in. nipple is tapped for a ¾-in. GI nipple and cut-off valve to which is connected a 20-ft length of ¾-in. rubber hose used for flushing. The flushing pressure is adjusted by the 3-in. valve on the pump discharge.

Water pumped from the manholes and vaults is usually sufficiently clean from the ¾-in. tap to be employed for flushing side walls and equipment as fast as the water level is lowered. For a thorough cleaning, the sediment is removed later by pumping or scooping.

Originally a trailer-mounted 300-gal tank of water was used for flushing the manholes. But the tank provided practically no pressure for flushing so that cleaning of machines and vaults was an unnecessarily tedious and time-consuming operation. This trailer tank was eliminated.

Turbine Shell Replacement Speeded

A. L. SMITH, Maintenance Supervisor, Sporn Plant, Central Operating Co, New Haven, W. Va.

Removal and replacement of turbine shells have been speeded by using a modified tip on an oxy-acetylene torch to heat the large bolts in the horizontal joints, and by keeping the bolt holes, bolt seats, and threads clean.

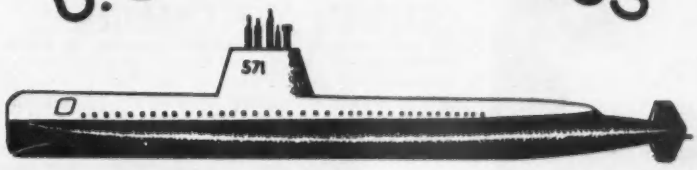
Heating the bolts requires 4 to 5 min for removal from the shell joint and 7 to 8 min for stretching after the shell is replaced. This operation utilizes a torch with tips bent to about a 45-deg angle, so the blow pipe is off the side of the bolt and 10 in. off the tips as illustrated.

After the torch is lighted, oxygen is adjusted to give a feather-like flame 3 to 4 in. long. The flame is directed

.....another Shawmut first

Amp-traps*

For U.S.S. NAUTILUS



FIRST NUCLEAR POWERED SUBMARINE

...How about letting Amp-traps stop dangerous short circuits for you?

In Canada — Powerlite Devices, LTD.

©The Chase-Shawmut Co. 1953 *Trade Mark

THE CHASE-SHAWMUT CO., NEWBURYPORT, MASSACHUSETTS

5 reasons for specifying RT&E TRANSFORMERS

5

HIGH IMPULSE LEVEL

Impulse level with built in safety factor considerably exceeds industry standards and is accomplished by—low layer insulation voltage stress—stepped back and graded overinsulation—space wound windings at coil ends—raps positioned in center of H.V. windings.

4

OIL FILLED PRIMARY BUSHINGS

Primary bushings are a wick-fed oil-filled type to eliminate corona and radio noise.

3

EXTERNAL TAP CHANGER

All tap changers are externally operated to avoid opening of unit—breaking of factory cover seals—contamination of oil from moisture and dirt—provides a greater convenience for tap changing and tap position identification in a matter of seconds. Unit remains sealed for longer life.

2

STANDARD 5 YEAR GUARANTEE

All RT&E transformers are guaranteed for 5 years from date of shipment from factory, free from defective workmanship and materials.

1

D. B. P. C. (inhibited oil)

All RT&E transformers are inhibited with D.B.P.C. to reduce oxidation —sludge—corrosion—acid formation and to increase transformer life.

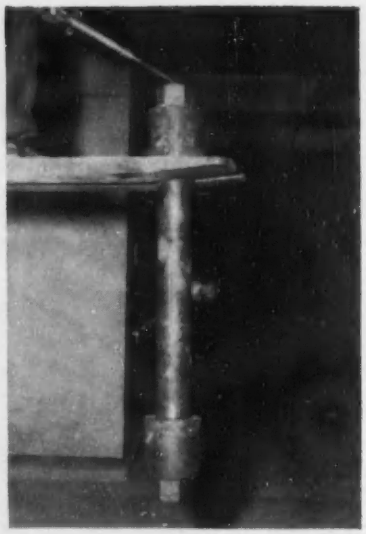
SIZES
3 THRU 500 KVA
2400 TO 14,400 VOLTS
SINGLE & DOUBLE
BUSHINGS

WRITE FOR CATALOG

632 N. 8TH ST.
MILWAUKEE 3,
WISCONSIN

R T & E Co.

BRANCH PLANT:
WAUKESHA,
WISCONSIN



MODIFIED TORCH directs oxy-acetylene flame through axial hole of bolt to heat it for removal or stretching

into the axial hole through the bolt center and moved slowly up and down, using about a 3-in. stroke. This procedure gives a bluish flame at the opposite end of the bolt.

Considerable time can be saved by keeping the bolt holes, seats, and threads clean while the shell is removed. One way to protect them from obstructions such as pliable insulation is to place a 1 by 1.5 in. rivet in each bolt hole with the head of the rivet covering the hole. A round steel pin, about 1.75 by 2.5 in., with a flanged head is placed in each jack-bolt hole. Rivets and pins are placed before the turbine shell insulating is started.

Plug Holder Controls Use of Motorized Tools

H. G. YOST
E. A. WILSON
Maintenance Dept, Ohio Power Co, Newark, Ohio

Plugs attached to power cords and placed in padlocked boxes prevent unauthorized operation of grinders, drills, lathes, and table saws having permanently connected cords. The boxes may be bolted to the machine or mounted near the power outlet. There are no power outlets inside the box, which is slotted to hold the plug-ends of one or more cords until released.

Only authorized persons have keys for these boxes and they are held responsible for the use of such tools.

MIKE THE MOLE SAYS:

Give the GUY a CHANCE

I get around... and I know that Chance Anchors really hold

YOU GET THE MOST FOR YOUR MONEY WITH CHANCE ANCHORS the most complete line

8-WAY EXPANDING

The guy load is distributed all around the anchor—no wasted space between blades. Usually installed in clay or loam.

NO-WRENCH SCREW

For hand or machine installation. Pitch-controlled blade goes down faster and adds to holding power in sandy soil, soft clay or loam.

NEVER-CREEP

Made of structural steel. Pulls *entirely* against solid, undisturbed earth. For extra heavy loads in clay or loam.

CROSS-PLATE

For heavy-duty anchoring in machine-bored holes. Holds better than logs or slugs. Saves time and money.

SWAMP SCREW

For swamps, marshes, quicksand, river crossings or seasonally flooded areas. Screws down deeply by adding sections of pipe.

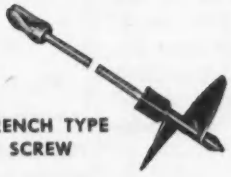
8-WAY CONE

Acts as inverted wedge. Flaring base and flat faces increase wedging action. Used in rocky areas with rock wedging.

EXPANDING ROCK

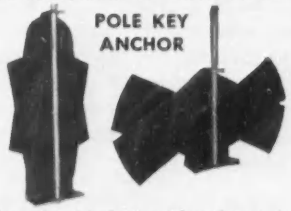
No grouting necessary. The greater the pull, the tighter it wedges against solid rock. Set in 2" drilled hole.

WRENCH TYPE SCREW



All steel—double arc welded. Anchor hub absorbs installation strain. For light loads in sandy soil, soft clay or loam.

POLE KEY ANCHOR



Keys poles at the butt to reinforce them against unbalanced loads in soft soil. Ideal for congested urban areas.

Both the soil type and condition are important factors in determining the type of installation and the kind of anchors to use. That's why Chance Anchors are made in so many types and sizes. The anchors shown above are made in a wide variety of sizes. Each type is designed for certain soil and guying conditions. Each of these anchors will do its specific job better than any other anchor you can choose.

Protect your investment in line construction. Analyze your soil and guying conditions, and specify the Chance Anchors that meet your particular requirements.

There is a CHANCE Anchor Distributor in your area who can probably fill your order directly from stock.

Specify* CHANCE *for Service!

A·B·CHANCE CO·

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

ABC INDUSTRIES

CA54-2

(Advertisement)

Concentric winding as applied to High Voltage Transformer Design and Manufacture

By C. M. Lovell
Vice President and
Chief Engineer
Moloney Electric Co.

Practically every transformer built by Moloney has used the concentric type core winding. The substantial success of the Moloney Electric Company has been established by it. This applies over the entire range of sizes and voltage classes.

For voltage classes 69 Kv and below, the concentric layer type of winding has been used with marked success, in past years. For voltage classes up to and including 230 Kv, 60,000 Kva, concentric type with disc or pancake coils for the high voltage windings have successfully been used. This type of construction has very good performance characteristics, but with the larger sizes and higher voltage classes being specified today, physical size has become a critical factor because of existing clearance limitations imposed by all transportation routes.

We, here at Moloney, when confronted with the necessity of building larger sizes and in higher voltage classes, concluded logically that we could still build a concentric type transformer, by using the concentric layer type of winding for these high voltages. In accomplishing this we have retained the favorable operating characteristics of this type of construction, while at the same time reducing overall size. Thus we have been able to increase Kv and Kva ratings greatly while still remaining well within the physical limitations existing transportation facilities imposed upon us.

As its name implies, the concentric layer type of winding is a winding of several layers positioned outside of the low voltage winding, or the low voltage and tertiary windings (Fig. 1).

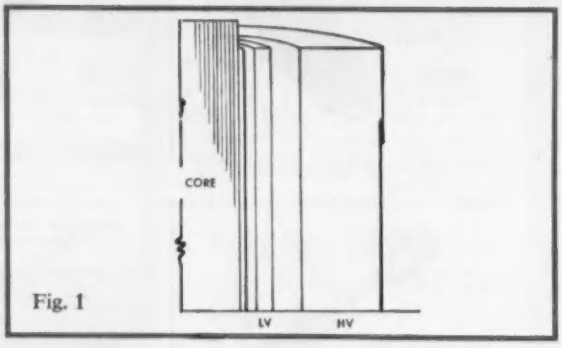


Fig. 1

The first layer is wound directly on a paper cylinder. This cylinder is solid in the space occupied by the conductors and is untreated at the ends.

The conductor consists of several strands of enameled rectangular copper wire. These are transposed continuously by a special machine, and the finished conductor has the strength of a solid wire the same area as the several strands (Fig. 2). This conductor is covered with paper by this same machine, the number and thickness of the paper depends on the voltage which is being applied to the conductor.

Because of the size and weight involved, a special winding lathe is used to wind the concentric layer coils. This machine is specially designed to wind the coil tightly, in both the axial and radial directions. As the conductor is wound on

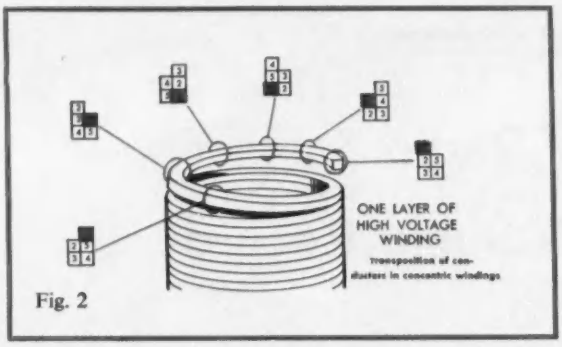


Fig. 2

the paper tube it is pressed down and against the preceding turn by a clamp which travels along the tube.

After the first layer is finished, axial spacer strips which form an oil duct are placed over the layer. Then, many layers of thin paper are applied to form an untreated tube of the size desired. To minimize shrinking in the drying process, tight application of the paper laminations is necessary.

Several layers are thus wound, the number being determined by the voltage of the winding. Each tube has an extension beyond the winding space of the layer. Each layer is also shorter than the preceding one. This stepping back of the winding space is determined by the voltage class and the number of layers. A smooth voltage distribution is obtained in this way.

Over the last or outside layer is wound a paper tube and oil ducts, and finally a shield is built over this tube (Fig. 3). This shield is connected to the line turn and has the effect of producing a nearly uniform impulse voltage distribution.

On completion of the winding the tubes extending beyond the wire space are flanged outward as shown.

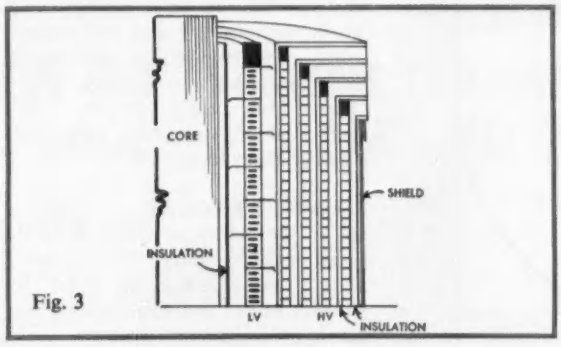


Fig. 3

The concentric layer winding is applied to grounded neutral classes of transformers. The neutral is in the layer next to the low voltage winding. Thus a much smaller space between the low voltage coil and the first layer of the high voltage can be used. This makes for low reactance inherently.

Since the windings of the concentric type of transformer are axially balanced, the stress under short circuit is negligible in the vertical direction. The stress is practically all in a radial direction and since the windings are already circular and well braced, no displacement can occur. This type of winding has been tested under the most severe short circuit conditions with no damage (Fig. 4).

MEB3-47

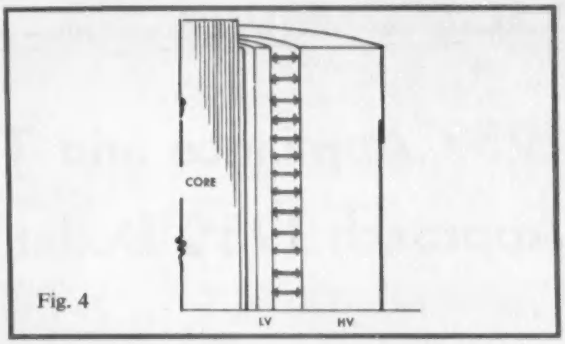


Fig. 4

The optimum impulse voltage distribution curve would be a straight line. The concentric layer winding with its shield will give almost the theoretical distribution curve. Small cusps will appear at each layer end and these require additional insulation which is easily applied on the transposed conductor (Fig. 5).

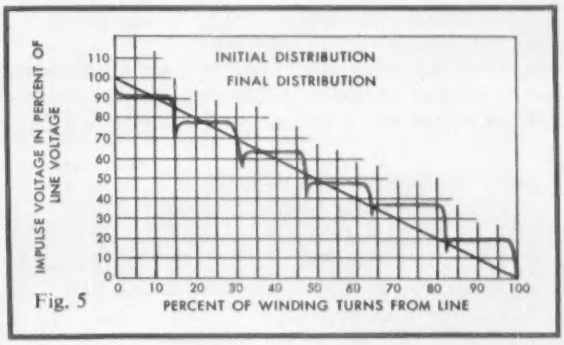


Fig. 5

Many large transformers are now supplied with forced-oil cooling. The concentric layer winding lends itself admirably to this method of cooling. The ducts next to the winding are all vertical and it is quite simple to distribute properly the oil flow to all windings and the core (Fig. 6).

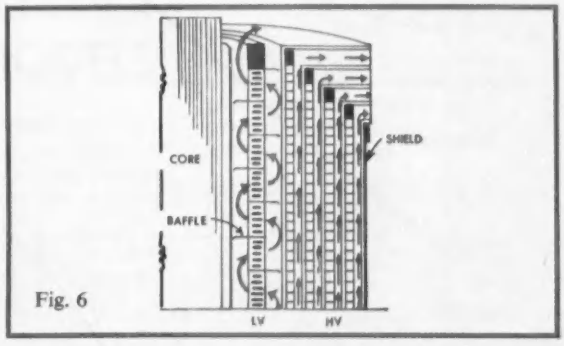


Fig. 6

Because of the smaller space between windings, the coils can be shorter, have a greater radial build and still obtain the required reactance. Savings in critical winding space reflect favorably in the overall size, weight and oil required. It permits construction of the largest transformers and it is possible to ship them in their own one piece tanks. This favorable size and weight factor, makes assembly at the site much easier.

MOLONEY ELECTRIC CO.
ST. LOUIS 20, MISSOURI

1953 Appliance and TV-Radio Sales Approach 1950 Dollar Volume Record

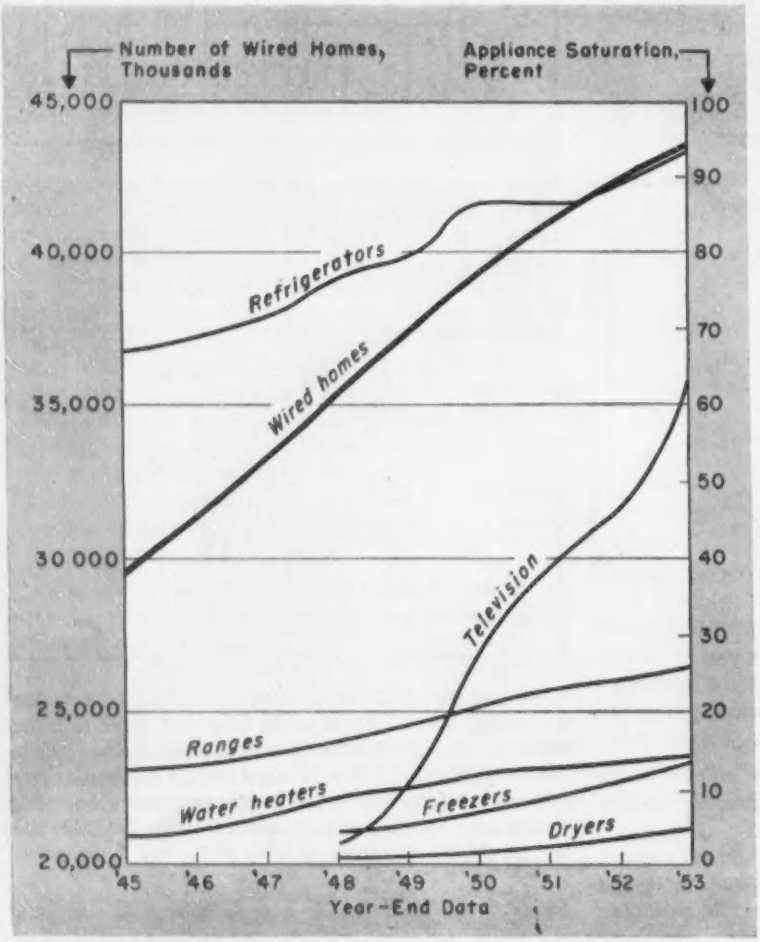
Appliances beat all previous years with $5-billion volume; TV-radio increase short of 1950 total. Air conditioners, disposers, ranges, and automatic washers biggest gainers

The electrical home appliance, radio and television industry had a surprisingly good year in 1953.

An increase in dollar sales of 18.4% over 1952 brought volume to $7,301,939,750—a figure exceeded only in the record year of 1950. Television and radio sales, which accounted for $2,270,723,850 of the total, made an increase of 14.7% and appliances, with a volume of $5,031,215,900, went ahead 20.2%.

Air Conditioners, Broilers, the Leaders . . . Among major appliances the parade was led by air conditioners, which nearly tripled 1952 volume; food waste disposers, ranges, water heaters, automatic washers, and refrigerators following along. Small appliances were led by broilers, with deep fat fryers, desk and bracket fans, steam irons, shavers, fan-type heaters, and coffeemakers close behind.

The only major appliances to decline at all were ironers, off 19.6% in units and 24.6% in dollars; vacuum cleaners, off 2.4% unitwise and 0.8% in dollars; and conventional washers, off 3.6% in units, 4.1% in dollars.

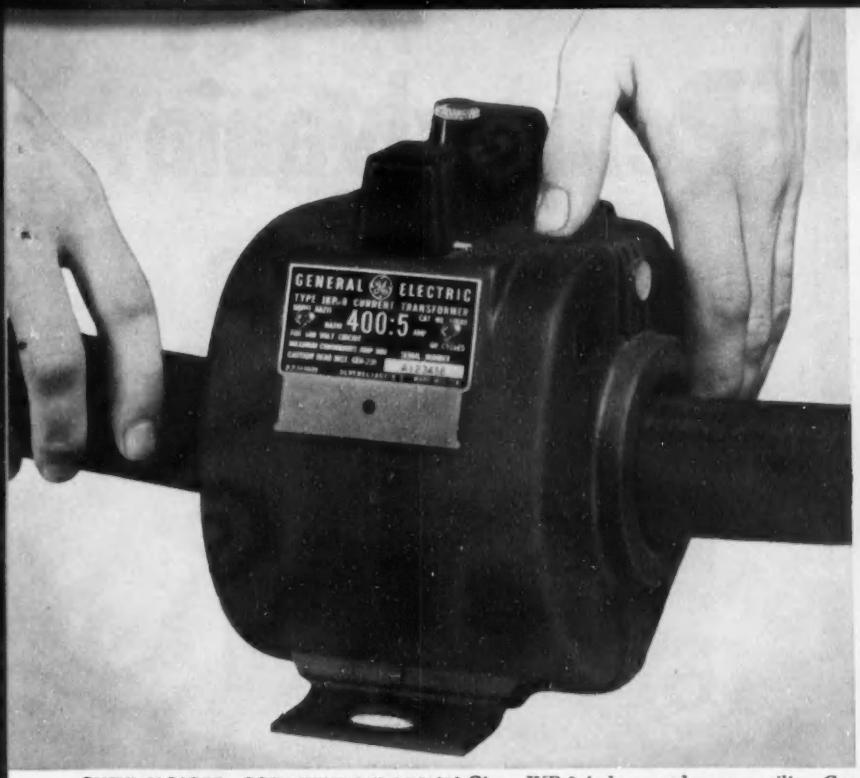


Tough Competition . . . The 1953 sales record was achieved against a background of intense competition among manufacturers for industry dominance, of absorptions of several smaller producers by the bigger, of the highest failure rate among retailers since the early 1930's, of widespread price cutting, of retail credit troubles, and of confusion over the imminence of color TV. It was a year, too, in which the retailer found the replacement and trade-in market increasingly important to his sales volume and discovered that some of the newer devices were accounting for a growing share of that volume.

Range Sales Accelerate . . . However, not all the new, low-saturation appliances made big gains. For example, electric dryers pushed up 10.8% to 525,000 units, and dishwashers, the industry's "sleeping beauty", only gained 2.9% for a total of 180,000 sales. But electric ranges, an old standby with a relatively low saturation, jumped 22.6% for a total sale of 1,300,000 units and a new acceptance percentage of 25.9, despite the fact that 44.1% of sales, according to 180 dealers, were replacements and 27.8% of sales involved a trade-in.

Washers, too, have a high replacement ratio, 71.6%, and trade-ins are involved in 54.5% of sales. But in

(*Continued on page* 232)



BUTYL-MOLDED, OPEN-WINDOW DESIGN Gives JKP-0 indoor-outdoor versatility. Cut your stock and inventory costs with JKP-0 indoor and outdoor 600 volt applications.

4 in 1

NEW G-E CURRENT TRANSFORMER REPLACES 4 STANDARD MODELS

An outstanding advantage of the Type JKP-0, 600-volt butyl-molded current transformer is its versatility —it easily replaces 4 different types. Here are four ways the JKP-0 saves you money:

1. STOCKING COSTS REDUCED. Standardizing on the JKP-0 cuts costs by reducing stock requirements, simplifying ordering.

2. MAINTENANCE IS REDUCED. JKP-0 transformers will not corrode, breakage is reduced, no painting is needed—JKP-0 is butyl-molded.

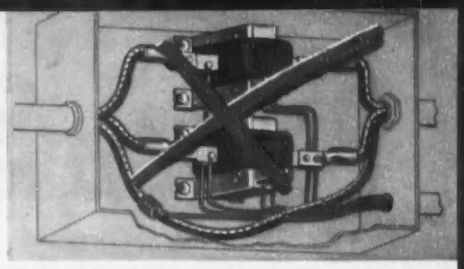
3. INSTALLATION COSTS CUT. The JKP-0 does not require elaborate arrangements of crossarms, hanger connections, etc.—and the amount of wiring is reduced.

4. LOWER INITIAL COST. This versatile transformer sells for less than most of the conventional types it replaces.

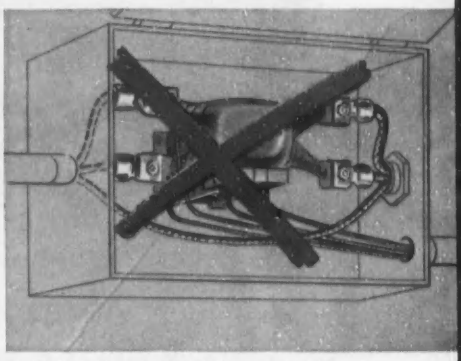
Write or call your nearest G-E Apparatus Sales Office, or authorized agent or distributor. Ask for Bulletin GEA-5874. General Electric Company, Schenectady 5, New York. 604-38

You can put your confidence in—

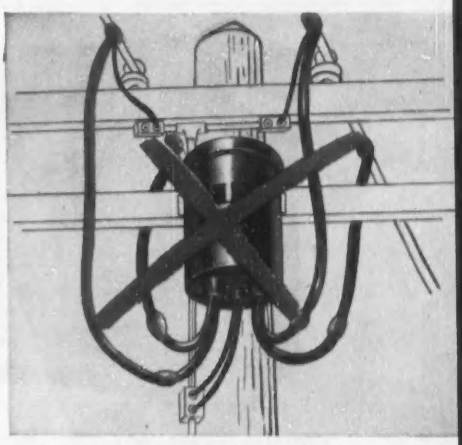
GENERAL ELECTRIC



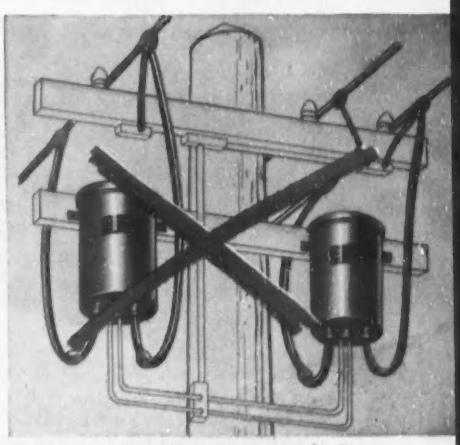
REPLACING INDOOR JL-1 (or newer JKR-0) with the JKP-0 means simplified wiring, fewer connectors—cut costs!



CARRY ONE MODEL in stock instead of four! Above: JKR-1, another transformer easily replaced by the new JKP-0.

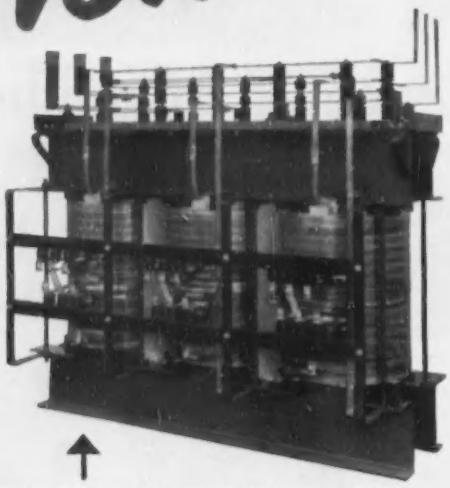


FOR OUTDOOR JOBS the JKP-0 eliminates costly crossarms and connectors demanded by conventional Type JKB-1.

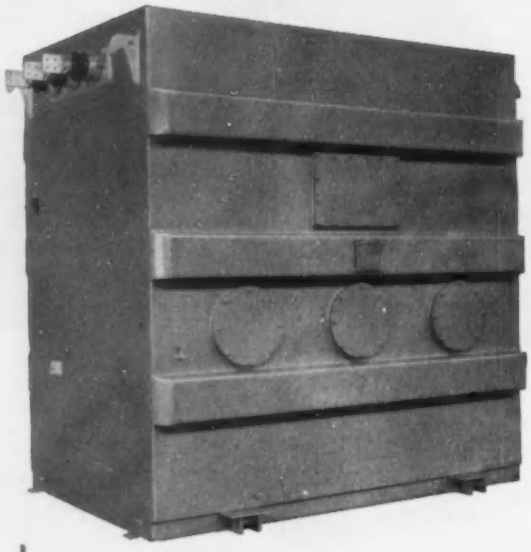


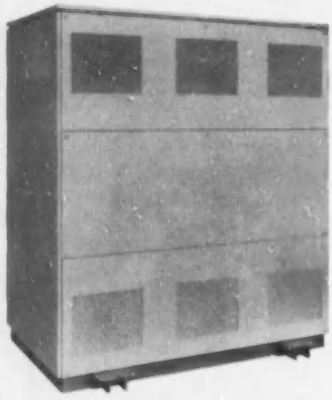
ANOTHER OPPORTUNITY to standardize is realized when butyl-molded JKP-0 replaces JKB-2 outdoor current transformer.

Now... 84 Pennsylvania



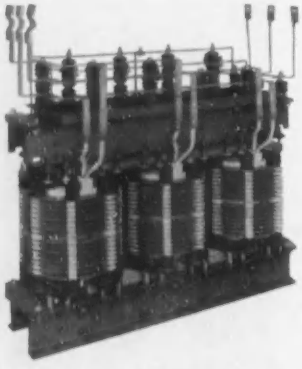
2000 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
2400Δ-480Δ volts.
Station auxiliary, sealed-in-nitrogen.





1000 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
12,470Y-480Δ volts.
Unit substation service, ventilated type.

1000 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
12,000Δ-480Y/277 volts.
Unit substation service, sealed-in-nitrogen.



500 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
2400Δ/4160Y-480Δ volts.
Network, submersible, sealed-in-nitrogen.

500 Kva, 3 Phase, 60 Cycles, 150°C. Rise.
12,500Δ-216Y/125 volts.
Network, submersible, sealed-in-nitrogen.

CLASS H Transformers

in Service... Including 4-2000 kva Units

The Largest Class H Transformers Ever Built

No doubt about it — Class H transformers are the greatest transformer development of the last decade. Nothing like it has captured the imagination of the transformer industry since the introduction of cold rolled steel.

Pennsylvania Transformer engineers have pioneered the development of Class H insulating materials and are credited with designing and placing into service the world's largest Class H units.

Eighty-four Pennsylvania Class H transformers, ranging in size from 250 Kva through 2000 Kva — up to and including 15 Kv — are installed in unit substations, network systems, and generating stations throughout the country. The trouble-free operating record of every one of these units is substantial proof of the outstanding electrical and mechanical designs of Pennsylvania Class H Transformers.

Among the many advantages of Class H Transformers are the following:

- Safest transformers ever developed;
- No fire or explosion hazard;
- Carry the lowest fire insurance rates;
- Least affected by water;
- Exceptionally high overload capacities;
- Minimum maintenance — even in highly contaminated areas.

PENNSYLVANIA CLASS H TRANSFORMERS are available in the following sizes:		
	KVA	VOLTAGE
Ventilated	Up to 3000	Up to 15 Kv
Sealed-in-Nitrogen	Up to 2000	Up to 15 Kv

For further information on Pennsylvania Class H transformers, we invite you to write to Pennsylvania Transformer Company, Box 330, Canonsburg, Pa., and ask for your free copy of Bulletin 951 — "H . . . in a Class by Itself."

PENNSYLVANIA TRANSFORMER COMPANY

A McGRAW ELECTRIC COMPANY DIVISION

CANONSBURG, PENNSYLVANIA • ***Greater Pittsburgh District***

1953 Dollar Volume of Appliance Sales Tops 1952

	1953 Units	1953 Retail Value	1952 Units	1952 Retail Value
Air conditioners, room	1,075,000	420,530,000	365,000	141,758,000
Bed coverings	890,000	33,775,500	830,000	35,275,000
Blenders	335,000	13,383,250	395,000	16,392,000
Broilers	1,320,000	72,402,000	434,700	13,172,100
Cleaners, vacuum	2,948,000	267,427,500	2,996,800	264,868,300
Clocks	7,625,000	52,993,750	6,700,000	48,575,000
Coffee makers	3,685,000	73,515,750	3,000,000	60,185,500
Dehumidifiers	98,000	13,715,100	87,450	12,505,350
Dishwashers	180,000	54,000,000	175,000	52,500,000
Dryers, clothes	685,000	168,521,250	634,850	162,781,000
Fans: all types	4,101,000	144,818,800	3,075,000	109,896,500
Food waste disposers	353,000	45,890,000	260,000	33,800,000
Freezers, home	1,200,000	480,000,000	1,140,000	421,800,000
Fryers, deep fat	2,650,000	79,500,000	1,525,000	45,673,000
Heaters, all types	1,380,000	36,235,250	1,202,000	31,203,000
Heating pads	1,825,000	12,683,750	1,500,000	10,425,000
Hotplates	695,000	6,602,500	905,000	8,597,500
Ironers	170,000	33,293,800	211,400	44,182,600
Irons	7,215,000	117,022,250	6,235,000	97,384,000
Lamps bulbs & tubes total	2,136,800,000	572,400,000	1,849,994,000	484,100,000
Fluorescent	82,300,000	108,000,000	77,629,000	93,000,000
Incandescent	985,000,000	250,000,000	920,825,000	222,000,000
Photo	425,000,000	65,800,000	341,820,000	58,200,000
Miniature	412,500,000	123,500,000	359,320,000	94,800,000
Christmas tree	232,000,000	25,100,000	150,400,000	16,100,000
Mixers, food	1,885,000	67,534,200	1,830,000	69,122,250
Radios, home	4,282,500	134,898,750	4,043,100	136,454,600
Radios, portable	1,795,500	62,591,100	1,719,900	59,336,500
Radios, clock	2,301,000	78,234,000	1,929,000	65,586,000
Ranges	1,300,000	332,800,000	1,060,000	270,300,000
Refrigerators	3,775,000	1,113,625,000	3,570,000	1,017,450,000
Roasters	470,000	20,680,000	425,000	17,850,000
Shavers	3,500,000	94,500,000	2,750,000	68,612,000
Television	7,000,000	1,995,000,000	6,096,000	1,719,072,000
Toasters	3,165,000	63,351,730	2,975,000	59,727,700
Waffle irons—Sand. Grills	1,529,000	32,873,500	1,456,000	29,848,000
Washing machines				
Automatic & Semi-Non-automatic	1,975,000	522,012,500	1,684,100	471,076,400
	1,525,000	227,987,500	1,582,400	237,818,900
Water heaters, storage	862,000	113,784,000	720,000	95,040,000
Water systems	720,000	122,040,000	682,000	110,484,000

(*Continued from page* 228)
many cases consumers are replacing conventional types with automatic models—in effect a completely new appliance. That's why automatic washer sales jumped 17.3% to 1,975,000 units and why conventional machines fell off 3.6% to 1,525,000.

Water Heater Plods Along . . . A completely different problem is presented by the water heater. Saturation as of January, 1954, is still low—only 14.7%—but this appliance with a 19.7% gain in 1953 still only sold 862,000 units. Despite this relatively small figure, 37.2% of sales went to homes already owning electric water heaters and six percent of sales involved a trade-in. Freezers, on the other hand, with a similar saturation (13.7%) and a smaller sales gain of 5.3% for a total of 1,200,000 units, found more new customers. Only 15.7% of freezer sales were replacements and only 4.2% involved a trade-in. Freezers, a comparatively new appliance in contrast to the water heater, are still expanding their market, even though 1953's gains were limited by the repercussions of the failure of many fly-by-night food plans.

Small Appliances—Big Jumps . . . Some of the most startling 1953 gains were racked up by small appliances which only a year or two ago were popularly supposed to have a limited market. Broilers made the biggest jump, 203.7% for a unit volume of 1,320,000. Deep fat fryers, another new product, leaped ahead 73.8% for sales of 2,650,000 units. Fan-type electric heaters jumped 36.2% for a total of 940,000 units. Steam irons, which have been leapfrogging other small appliances ever since they came on the market, set a new record of 3,950,000 units with a gain of 38.4%. Coffeemakers achieved a new popularity with sales of 3,685,000 units.

1954 Looks Pretty Good . . . The adjustment which didn't come in 1953 is, according to economists and industry experts alike, likely to make its appearance in 1954. The economists content themselves with the prediction of a drop in dollar volume of five or six percent. Appliance manufacturers are more specific. According to several who made estimates for Electrical Merchandising, some of the newer appliances will make gains, but these will be more than cancelled out by declines in the ranks of the bread-and-butter items. They estimate that freezers will be up 1.03%, dryers up 10.58%, ironers up 2.52%, dishwashers up 38.61%, disposers up 7.65%, and air conditioners up only 6.21% (they underestimated air conditioner gains by 120% in 1953). On the other hand they predict that refrigerators will fall 9.06%, conventional washers 7.83%, automatic washers 3.33%, ranges 7.32%, and water heaters 5.23%.

Appliance Saturations, Jan. 1, 1954

Product	No. Homes With	% of U. S. Wired Homes
Air conditioners, room	1,381,000	3.2
Bed coverings	4,295,500	9.9
Blenders, liquefiers	1,745,500	4.0
Broilers	3,761,000	8.4
Clocks	36,470,000	83.7
Coffee makers	23,677,800	54.3
Dishwashers	1,380,000	3.2
Dryers, clothes, elec and gas	2,180,400	5.0
Food waste disposers	1,697,000	3.9
Freezers	5,954,700	13.7
Heaters, convector and radiant	10,355,200	23.8
Heating pads	13,932,000	32.0
Hotplates	9,407,500	21.6
Ironers	4,061,000	9.3
Irons	39,272,500	90.1
Irons, steam	10,770,000	24.7
Mixers	13,785,000	31.6
Oil space heaters	7,735,000	16.6
Radio receivers	45,775,000*	98.4
Ranges	11,285,700	25.9
Refrigerators	39,397,000	90.4
Roasters	4,107,000	9.4
Sandwich—waffle combs	14,200,900	32.6
Shavers	14,873,500	34.1
Television	27,500,000	63.1
Toasters	31,350,000	71.9
Vacuum cleaners	26,370,000	60.5
Washers, electric	34,194,200	78.5
Water heaters	6,412,800	14.7

* Radio saturation based on 46,539,000 total homes. All other figures based on 43,580,000 domestic and farm electric customers.

Distribution of 1953 Appliance Sales by Regions

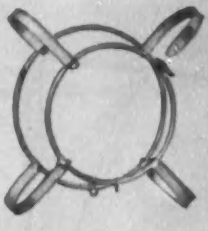
	Residential and Rural Electric Customers		Shipments by Percent of U. S. Total									
	Jan. 1, 1954	%	Washers 1st 8 mos.	Ironers 1st 8 mos.	Dryers 1st 8 mos.	Refrig-erators 1st 9 mos.	Freezers 1st 9 mos.	Ranges 1st 9 mos.	Water Heaters 1st 9 mos.	Tele-vision 1st 9 mos.	Radio 1st 9 mos.
New England	2,865,234	6.57	6.29	3.86	4.20	5.68	4.19	7.51	5.43	6.35	6.33
Middle Atlantic	8,734,303	20.04	18.99	20.72	17.95	21.47	14.60	14.19	14.70	20.97	24.50
East North Central	9,104,164	20.89	22.17	34.39	37.00	20.56	22.02	19.70	23.01	21.43	23.37
West North Central	4,172,545	9.58	8.30	11.10	11.22	8.05	14.34	7.69	10.10	9.07	7.61
South Atlantic	5,770,559	13.24	13.06	7.22	5.59	15.29	13.29	22.49	26.53	12.03	12.32
East South Central	2,731,895	6.27	6.34	2.07	2.39	7.19	7.35	10.66	6.87	5.15	5.05
West South Central	3,952,065	9.07	9.43	5.34	3.71	9.32	12.60	3.74	1.90	10.10	7.63
Mountain	1,440,895	3.31	3.34	4.12	2.80	2.94	4.70	4.19	4.01	3.32	2.71
Pacific	4,808,888	11.03	12.08	11.18	15.14	9.50	6.91	9.83	7.45	11.58	10.48
Total	43,580,548	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

all along the line....

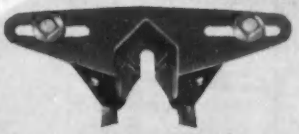
MIF POLE HARDWARE

improves performance
simplifies installation
gives longer service life

POLE MOUNTS



JENNE STRAND HOLDERS



TRANSFORMER MOUNTING PLATES

AUXILIARY EYES

GUY HOOKS

POLE EYE PLATES

SPAN GUY HOOKS
HOUSE BRACKETS

SPAR ARM GAINS

GUY CLAMPS

CABLE SUSPENSION CLAMPS

CURVED WASHERS
Rectangular — Square

Light Duty

Medium Duty

UNIVERSAL CLAMPS

MALLEABLE IRON FITTINGS CO.

Pole Hardware Division Branford, Connecticut

N. Y. Office: 30 Church St.

Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • B. H. McCoin, Knoxville, Tenn. • E. A. Thornwell, Inc., Atlanta, Georgia • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Kruse, San Francisco, Calif. • L. G. Wendegatz, Kansas City, Mo. • Williams Sales Co., Fort Myers, Fla. • Williamson Sales Co., Shreveport, La. • O. C. Witte Co., Detroit, Mich.

MIF 1854 ★ ONE HUNDRED YEARS ★ 1954 MIF

another great record

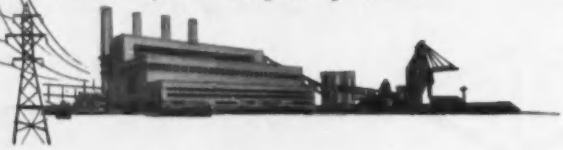
OVER 9,000,000 ON THE

Over nine million kilowatts of new thermal and hydro-generating capacity put on the line during 1953, again offers proof that America's power companies are fully aware of their tremendous responsibility for the growth and progress of this nation. The continuing program of expansion being carried out is a monument to the foresight of power executives and engineers. The astonishing strides they have made toward more efficient utilization of fuel, and the rapid implementation of new engineering developments for universal benefit, mean that electricity will continue to be America's Best Bargain. Their achievements represent many decades of prodigious, cooperative work; of sound preliminary planning and long range vision.

A considerable portion of this new capacity—well over 4,000,000 KW . . . is being generated by B&W Boilers of all types put in service during 1953. Represented are B&W Radiant, Stirling, Open Pass, and Integral-Furnace Units, embodying every major advance in the science of modern combustion and steam generation. Cyclone Furnaces, Pressure Firing, Reheat, Divided Furnace Construction, and Cyclone Steam Separators, all proved by years of intensive operating experience, are included in these units—singly or in combination, as indicated by individual circumstances and conditions—to effect the greatest possible generating economies:

- Thirteen of these units are for design pressures over 2000 psi—all with Cyclone Steam Separators for natural circulation
- Four are Cyclone-Furnace-Fired
- Nineteen are for Pressurized-Furnace-Firing
- Eighteen—including the largest units of their kind—are equipped with reheaters
- Twenty have B&W's simple Divided Furnace construction for maximum savings in building volume

The experience and advanced technology reflected in B&W's contribution to this huge volume of new capacity is a good indication of the confidence placed in B&W by electric utilities at home and abroad . . . confidence based on the sound platform of past experience. B&W's wealth of research and creative engineering talent, its broad and diversified facilities, are available to help you find the most efficient and economical solution of your steam power problems.



set by America's Utilities

KW OF NEW CAPACITY LINE IN 1953

ONE OR MORE
B&W BOILERS WERE PLACED
IN SERVICE FOR THE FOLLOWING UTILITIES IN 1953

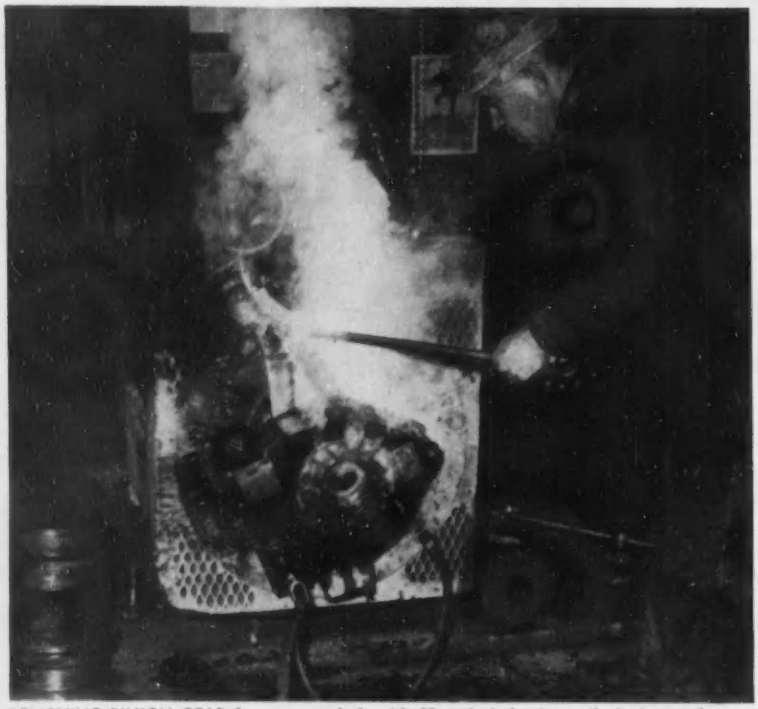
Appalachian Elec. Power Co.
Braintree Electric Light Dept.
Central Louisiana Electric
City of Burbank, California
City Electric Light Company, Brisbane, Australia
City of Glendale, California
City Public Service Board, San Antonio, Texas
Commonwealth Edison Co.
Consolidated Gas Elec. Lt. & Pr. Co. of Baltimore
Consolidated Edison Co. of N. Y., Inc.
Consumers Power Co.
Dallas Power & Light Co.
Detroit Edison Co.
Duquesne Light Co.
Electricite de France
Florida Power Corp.
Gulf Power Co.
Houston Lighting & Power Co.
Indianapolis Power & Light Co.
Iowa Public Service Co.
Iowa-Southern Utilities Co.
Isefjord Power Co.
Jersey Central Power & Light
Kentucky Utilities Co.
Kingdom of Greece
Mississippi Power Co.
Niagara-Mohawk Power Corp.
Ohio Edison Co.
The Ohio Power Co.
Oklahoma Gas & Electric Co.
Philadelphia Electric Co.
Public Service Co. of Colorado
Public Service Company of New Mexico
Public Service Div. of Commonwealth Edison Co.
Soc. Gen. Elec. Della Sicilia
Societa Idroelittrica Peimonte
Societa Meridonale de Electricita
Tampa Electric Co.
Tennessee Valley Authority
Tucson Gas Elec. Lt. & Power Co.
United Illuminating Co.
West Texas Utilities Co.
Wisconsin Power & Light Co.

The Babcock & Wilcox Company, Boiler Division
161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX
BOILER DIVISION

G-635

INDUSTRIAL APPLICATIONS



REMOVING PINION GEAR from motor shaft with 60-cycle induction coil eliminates damage experienced with former high tonnage pressure method. Same coil is used to expand the pinion for replacement. Induction coil is rated 440v, 12kw, and has an 8 in. ID

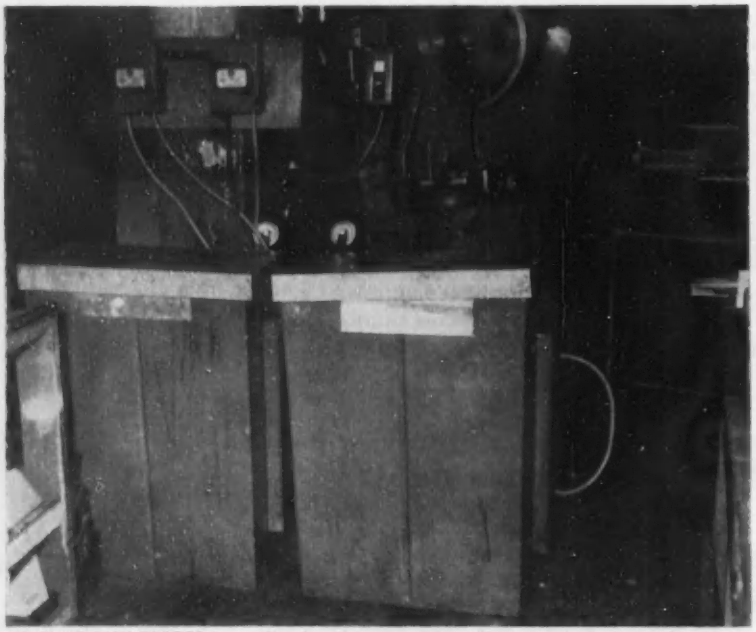
Induction Heat Aids Gear Removal

D. E. DOME, Commercial-Industrial Dept, The Ohio Power Co, Newark, Ohio

The removal of pinion gears from the motors of diesel electric engines at the Baltimore & Ohio Railroad Repair Shops, Newark, Ohio, has been simplified and accelerated by use of 60-cycle induction coils. A 440-v, 12-kw, 8-in. (inside diameter) induction coil can raise pinion to removal temperature 216 F above ambient in 50 sec.

Damage to pinion from high tonnage pressure has been eliminated and the possibility of excessive surface temperature damage formerly experienced with use of oxyacetylene torches is no longer present. Coil is completely portable, easy to handle and requires little or no maintenance. Same coil can be used to expand the pinion for replacement.

Infrared Oven Reduces Saw Blade Rejects



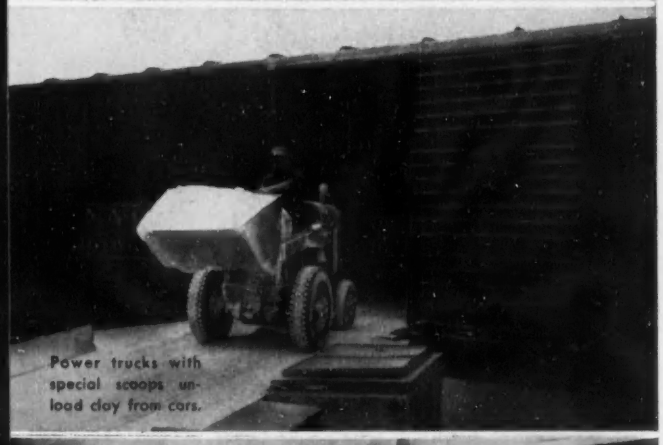
HEATING SAW BLADES in small infrared oven speeds stiffening and eliminates former hot oil method. Operation is cleaner and faster and rejects are reduced

D. E. DOME, Commercial-Industrial Dept, The Ohio Power Co, Newark, Ohio

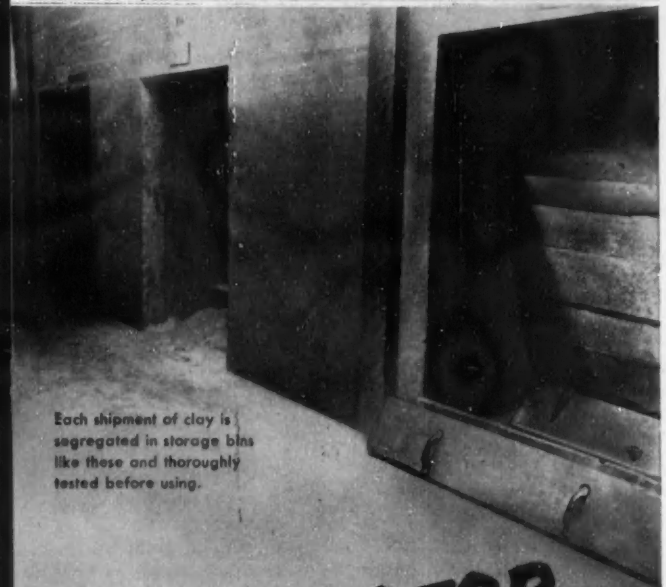
The stiffening of saw blades at Larsan Mfg Co, Newark, Ohio has been transformed from a haphazard operation to one of extreme simplicity through the use of infrared heat. A small electric oven having five 150-w infrared lamps accommodates 10 blades. Through thermostatic control desired temperature is reached in less than 2 min. Oven can be easily operated by inexperienced female labor. Operation is clean and fast and rejects from the infrared oven are practically nonexistent.

Previously, the stiffening operation was a messy, unsatisfactory production bottleneck. Blades were clamped in frames in quantities to prevent warping, and then immersed in hot oil for a period of several hours. Rejection rate from the old method was rather high.

The world's finest ceramic raw materials come from the states shown in color. Victor uses them exclusively.



Power trucks with special scoops unload clay from cars.



Each shipment of clay is segregated in storage bins like these and thoroughly tested before using.

Specify **VICTOR**

PURIFIED PORCELAIN

INSULATORS

Another Reason Why—

VICTOR Makes Better Insulators

WE USE AMERICAN CLAY, FLINT AND FELDSPAR EXCLUSIVELY!

BETTER INSULATORS begin with better materials. Victor was the *first* to recognize the superior qualities of *American* clays and the advantages of closer control over sources of supply. That's why Victor *Purified* Porcelain insulators have greatest uniformity in mechanical and electrical strength values. For the whole story, send for our free Booklet, "The Story of Victor and Purified Porcelain."

VICTOR NO. 9
LOW VOLTAGE
PINTYPE

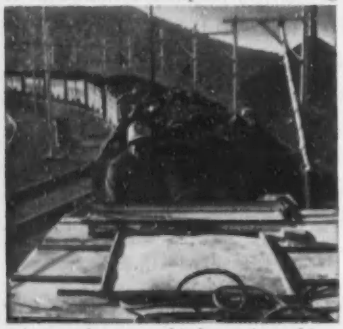
VICTOR INSULATORS, INC., VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions
Guy Strains • Spools • Switch and Bus Insulators
Custom Designed Porcelain

what's NEW in Engineering

Laboratory facilities for engineering research are available to individuals and groups with worthwhile projects at Richmond Engineering Field Station, administered by Department of Engineering, University of California. Charges are based on actual expenditures with appropriate overhead. For information, write Institute of Engineering Research, University of California, Berkeley.

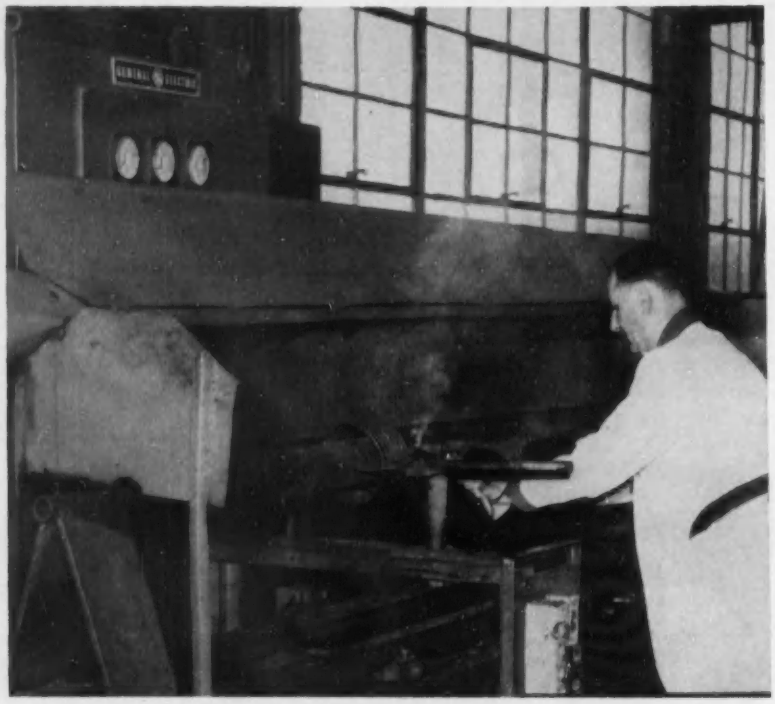
Rebuilding a near-ghost mine at Sunnyside, Utah, for greater coking-coal production with higher efficiency, is a current major project of Kaiser Engineers. The original Sunnyside mines, opened in 1896, were in bad condition. The problem was to rehabilitate and expand two existing



mines and open a third to raise coking-coal production from 1,000,000 to 1,715,000 tons per year. We'll send you a reprint of an article by Wesley Hyatt and R. G. Heers in *Coal Age* which tells the full story of Sunnyside's emergence from a "near-ghost" to one of the most efficient and modern coal producers in the West.

A $50,000 bonus goes to the first person to bring in a Tennessee oil well that will produce 50 barrels a day for six months, according to a new state law. Only 35 wells are now producing in Tennessee, but geologists think the State has rich oil possibilities.

When it comes to research, preliminary engineering studies, engineering design and layout, estimating, preparation of specifications, construction programing, negotiation of contracts, and procurement and expediting of materials and equipment—call or write: Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.



BREAKING BOND between rubber covering and metal core of printing rollers is speeded by induction heat. Rollers up to 8-in. diameter are processed in 6 min

RF Heating Processes Rollers Faster

L. ALBERTSON, Application Engineer, Philadelphia Electric Co

Instantaneous and scientifically controlled heat from a 20-kw high frequency generator and application coil cut 40 min off time required to separate rubber shell and metal core of printing rollers at Moreland Corp, Willow Grove, Pa.

Rollers which have been taken out of service at newspaper and printing plants are run through an r-f coil where high temperature by induction causes bond between rubber covering and metal core to break. A specially-designed blade cuts rubber open as it leaves the coil and it is then torn away from the core manually. Rubber is then discarded and the core is cleaned and prepared for recovering with a fresh base and shell.

Rollers up to 8 in. in diameter are processed in this manner and total time required is approximately 6 min. The job was done previously by turning down on a lathe and required 45 min.

Capacitors Save $675 Yearly

Power factor was raised from 78 to 90% and yearly savings in power bill is $675.00 at Cincinnati Terminal Warehouse, Inc, by installation of 75 kvar of 480-v, 3-phase, capacitors. The capacitors paid for themselves in one year and now the yearly saving in power bill is all profit.

Two large motor generator sets are used alternately to supply elevator load. One set is driven by a synchronous motor and the other by an induction motor. Both are operated from 480-v, 3-phase, 60-cycle supply. When the induction motor-driven M-G set was in operation, overall power factor dropped to 78%. The power rate penalized any power factor below 85%. Sixty kvar of these capacitors were installed at the M-G set and were switched on and off with the induction motor. Remaining 15 kva were installed at elevators. L. J. Langevin, Cincinnati Gas & Electric Co.

BLACKBURN *Hi-Strength* CONNECTORS

Make BETTER Connections — HIGH PRESSURE Connections!

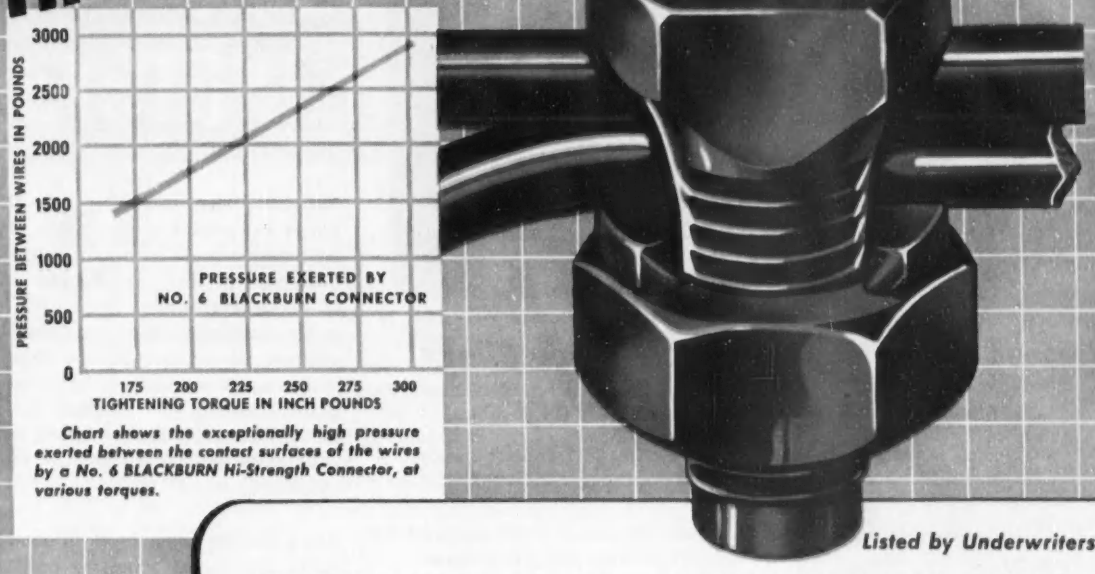


Chart shows the exceptionally high pressure exerted between the contact surfaces of the wires by a No. 6 BLACKBURN Hi-Strength Connector, at various torques.

Listed by Underwriters

HIGH PRESSURE Connections Are BETTER Connections

High pressure increases the contact area between the wires, effectively seals the contact surfaces from moisture and oxidation, and produces a lasting, low-resistance connection.

BLACKBURN Connectors Make Lasting High Pressure Connections because:

(1) They are made with the right combination of alloys — high strength alloys — to reduce frictional losses in the threads.

(2) They are made with smooth-cut threads, to increase their efficiency. These two factors insure more of the tightening torque being converted to "pressure between wires".

(3) Their corners and edges are all rounded, so that the high pressure cannot injure the wires.

(4) They actually test stronger than other connectors when pulled to destruction in a tensile-testing machine. This means that BLACKBURN Connectors have that extra strength required to maintain the high "pressure between wires" without stretching and loosening.

(5) The coefficient of expansion of the alloys used is substantially equal to that of copper. A temperature change of 100° F results in only 1% change in the "pressure between wires".

Yes, BLACKBURN Hi-Strength Connectors definitely make *better connections — for your protection!*

JASPER BLACKBURN CORPORATION
35 Madison St., St. Louis 6, Mo. **Phone CEntral 3007**

How ACCO REGISTERED Stock Slings Save You Money—with Safety

1 • **You Get ALL the Strength You Pay For**—DUALOC* Endings insure against any loss in the catalog strength of the preformed Green Strand wire rope the sling is made of.

2 • **You Lower Your Sling Maintenance Costs**—If damaged, any part of the sling can be replaced in your own shop with another ACCO *Registered* part of equal strength. No delay. You don't ship the whole sling to have one part repaired.

3 • **ACCO Slings are Stocked by Your Industrial Supply House**—His stock is based on YOUR needs. So, your sling inventory can be held to a minimum since your distributor's stock is as close as your telephone.

4 • **These Slings and Fittings are "ACCO *Registered*"**—This assures you of highest quality and safety throughout.

Write today to our Wilkes-Barre office for name of the ACCO *Registered* Sling distributor nearest you.

ACCO Registered DUALOC Slings

*Trade Mark • Patent No. 2463199

ACCO
WIRE ROPE SLING DEPARTMENT
AMERICAN CHAIN & CABLE
TRADE MARK

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn., In Canada: **Dominion Chain Company, Ltd.**, Niagara Falls, Ontario

INDUSTRIAL BRIEFS

Electroplating metal with nickel has been speeded up and costs reduced at the Crown Plating Co, Salt Lake City, Utah, by heating the electrolyte to about 120 F with two 5-kw thermostatically controlled immersion heaters. The heated solution cuts the time of electroplating to less than half the normal time. In addition, the plated product is given a bright finish. Previously the metal parts had to be buffed to get a bright, shiny finish. Wayne F. Mulcock, Business Development Dept, Utah Power & Light Co.

Removing exhaust steam with 1 kw in ventilating fans at Berwick Shirt Co, Harrisburg, Pa., has increased production and improved working conditions. Exhaust steam from new type bag presses created uncomfortable working conditions—thus retarding production. John Denvel, Industrial Power Rep, Pennsylvania Power & Light Co.

Relighting two shop areas at Pittsburgh Forgings Co, Coraopolis, Pa., has boosted production and facilitated inspection of forgings. Parallel lines of fluorescent fixtures furnish 65 ft-c in the maintenance machine shop. Inspection shop has 100-ft-c bluish-green mercury vapor installation to make checking of forgings easier. E. M. Wenner, Industrial Power Representative, Duquesne Light Co, Pittsburgh, Pa.

Space heating some parts of factory electrically solved a heating problem at Gray Printing Co, Fostoria, Ohio. Art Department, located rather remotely from regular plant heating system, has 2 5-kw heaters. Press Room was difficult to heat since presses are located so that it is necessary for operators to stand with their backs to an outside wall composed largely of steel sash windows. Three 1.5-kw strip heater type space heaters were installed along wall underneath windows providing curtain of warm air over windows. Since the installation of space heaters, employees have had no difficulty in keeping warm during the winter months. R. T. Woodruff, Industrial Power Engineer, Ohio Power Co, Fostoria, Ohio.

for High Voltage Cable

be safer...

be surer

with

SHIELDED KEYSTONE-HAZAPRENE

Shielding of electrical cables at voltages over 5000 volts is now generally recommended. By equalizing voltage stresses and preventing the formation of corona, shielding guards the life of the rubber insulation. It also prevents surface discharges, thus protecting men who handle the cable.

One of the important advantages of Shielded Keystone-Hazaprene over other such cables is in the controlled application of the copper shielding tape. In Shielded Keystone-Hazaprene this tape—as well as the auxiliary paper and cable tapes—is applied with constantly controlled tension, the most successful means of preventing undesirable physical stresses within the cable. Case histories have proved the proper application of shielding tape to be a very important factor in the service life of high voltage rubber-insulated cable.

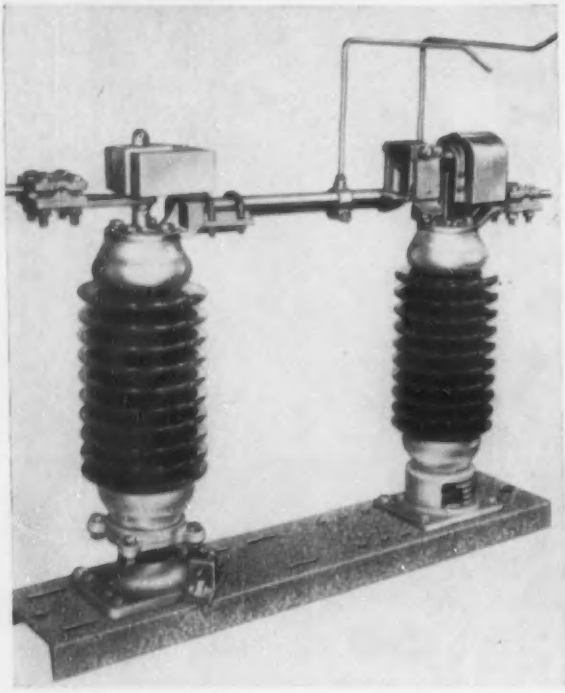
This exclusive Hazard feature, combined with the toughness of the mold-cured Hazaprene sheath and the stability of the Keystone insulation, provides a high degree of dependability, long service life and operating economy.

For transmission and distribution circuits, generator and transformer leads, test leads and similar uses, you'll use shielded cable for 5001 volts and up. And to protect personnel and vital electrical circuits, be safer and surer by specifying Shielded Keystone-Hazaprene. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

HAZARD *insulated cables*

1954

NEW EQUIPMENT



Disconnect Switch

A new line of group operated, rotating insulator, side-break disconnect switches for horizontal or vertical mounting are rated 400 and 600 amp, 7.5 through 69 kv. They have good ice breaking ability because the jaw contact rotates around the blade, developing high leverage. The 45-deg rotation of the jaw is controlled by blade movement. Jaw rotation is said to be impossible with the switch open.

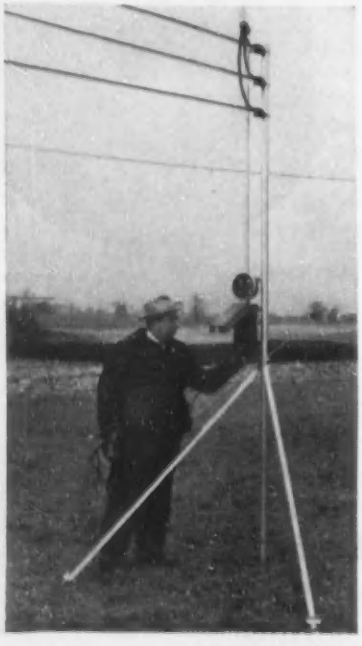
Current transfers are made by high-pressure, silver-to-silver contacts; no pivots or bearings for mechanical operation carry current. Contacts are full wiping, self-cleaning. Movable contacts rotate between fixed contacts under constant pressure. Current transfer contacts between blade ends and line terminals are enclosed in iridized aluminum housings.

Rotating parts above insulators operate in oilite bearings; rotating insulator is supported by a sealed ball bearing. Plated terminals are said to accommodate aluminum or copper conductors from No. 4 solid to ¾-in. IPS.

James R. Kearney Corp, 4236 Clayton Ave, St. Louis 10, Mo.

Service Mast

A new all-steel, temporary service mast can be quickly installed and is complete with heavy-duty insulators, utility box, and meter bracket. The mast raises service wires 12 ft off the ground and telescopes down to 8 ft for hauling and storage.



Installation is made by driving a 3-ft steel sleeve into the ground (with driving head furnished), inserting spacer pipe, and sliding mast unit over spacer. Six-ft angle braces attached to mast with a single bolt dig into ground for support.

Rain-tight, weather-proof utility box has two 120-v and one 220-v outlets separately fused. Box can be padlocked.

Utility Service Co, 921 13th St, Racine, Wis.

Phase Sequencer

A new phase sequence indicator combines the function of a pilot lamp and phase sequence indicator for portable, 3-phase equipment. The electrical network in the instrument is designed to sense phase rotation and provide a voltage greater than, or less than, that required to light a neon indicator. Lighting of the neon indicates the proper phase rotation.

Connection is made to the unit through a standard three-pin plug.

Adapters are available to convert existing pilot light assemblies into phase sequence indicators. Units are available for 110, 220, or 440-v, 60 or 400-cps, operation with standard or dimmer type lenses.

Brunswick Instruments, 66 Wendmere Rd, New Brunswick, N. J.

Crane Carrier

A new crane carrier for mounting a Model T-35 Bantam is said to provide maximum stability, versatility and maneuverability. It has a 12-in. "I" beam frame with a one-man driver's

Secondary Racks Built on the Job...

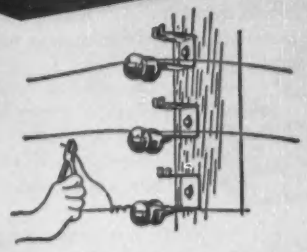
with HUBBARD SAGGER BRACKETS

No. 710
HOT GALVANIZED

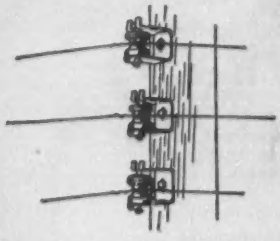
When special problems arise in secondary distribution . . . Hubbard Patented Sagger Brackets furnish a simple solution. They can be mounted in any spacing available, in any number required. Maximum strength is developed by positioning the installation bolt directly in line with the conductor.

The insulator rotates freely about the bolt, and when in sagging position acts as a wire stringing tool. When the correct sag has been set, the conductor is tied in and the insulator is snapped into vertical position over the two keeper lugs.

Typical Application



No. 710 becomes an effective wire stringing tool when in the horizontal, or sagging position. Conductors are strung, sagged and tied in while the insulator is in the horizontal position.



Units may be mounted at any spacing and in whatever numbers circumstances require. No. 710 affords a particular solution to those "special" problems.

HUBBARD AND COMPANY
ESTABLISHED 1843
PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA
"Hang the Load on Hubbard Hardware!"

THE NEW M·S·A FIRST AID KIT IS DIFFERENT... BECAUSE OF

IMPORTANT LITTLE THINGS LIKE THIS

Open lid serves as shelf when kit is mounted on wall or vehicle
Clear, concise, first aid instructions
Easy-to-keep-clean case
Wall mounting brackets
Dust and moisture proof rubber gasket
Packages extend above case for easy removal
Easy-to-read identifications

Here's a First Aid Kit that gives you the important *extras* in quality and performance. A few of the important case design and construction features which serve your needs better are illustrated above. And that's only part of the New M.S.A. First Aid Kit story. Quality control, and improved first aid materials are other important improvements that add up to the big difference!

So you can be sure of freshness, purity and sterility, every Unit "D" package is stamped with a Quality Control number. This number identifies the "pedigree" clear back through our every operation.

Our modernization program extends to first aid materials. Color keying of labels for antiseptics, burn treatments, and others assure quick identification. Swabs have gauze tips which are less absorbent, assure maximum utilization of antiseptic.

And there's more, lots more. Get the facts today. Write for our bulletin.

MSA SAFETY EQUIPMENT HEADQUARTERS

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.

At Your Service: 82 Branch Offices in the United States and Canada

Clip and Send today . . .
Get complete facts on
the Big News in First Aid
Kit Quality and Performance

NAME .....

TITLE .....

COMPANY .....

ADDRESS ..... STREET CITY STATE

Attach to Company letterhead, mail to: Mine Safety Appliances Company, 201 North Braddock Avenue, Pittsburgh 8, Pa.

cab having six windows.

Other specifications include a 16½-ft turning radius, 148-in. wheelbase, 236-in. overall length, 96-in. width, 8-ft 18 ⅜-in. height to the cab top, 4-wheel drive, 10 wheels, 6,000-lb front axle rating, 26,000-lb rear axle rating, a 6-cylinder gasoline engine developing 113 hp at 3,200 rpm, and a 5-speed transmission with dual range giving up to 10 speeds forward and 2 reverse. Total weight of the carrier with front and rear outriggers and fenders is 11,660 lb.

Shield Bantam Co, 300 Park St, Waverly, Iowa

Coming New Equipment

Received Too Late for This Issue

Aluminum Connector

Anderson Brass Works, Inc—Is a parallel groove design for aluminum conductors

Conductor Bender

John Teagle—Is a hand tool for bending relatively heavy insulated conductors

Breaker and Starter

Appleton Electric Co—Have UL approved enclosures for explosion-proof uses

Fire Extinguisher

A new line of pressurized, dry-chemical fire extinguishers in models from 5 to 20 lb is approved by Underwriters' Laboratories for Class B and C fires. To operate them it is necessary to pull a pin and squeeze a lever on the valve, which releases dry chemical under 150 psi air or nitrogen pressure.

The discharge nozzle fans the chemical outward and downward in a wide pattern and with great density. The control valve is equipped with a safety relief valve.

American-LaFrance-Foamite Corp, 135 E. LaFrance St, Elmira, N. Y.

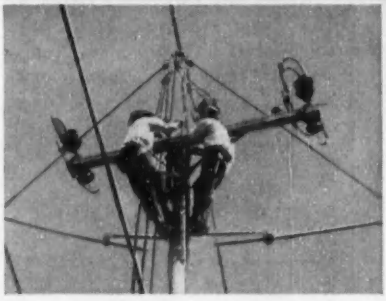
Voltage Indicator

A new high-low voltage indicator for use on ac and dc circuits is a bakelite panel with two pilot lamps marked "high" and "norm", and has two test jack receptors. Panel is mounted on a cast aluminum junc-

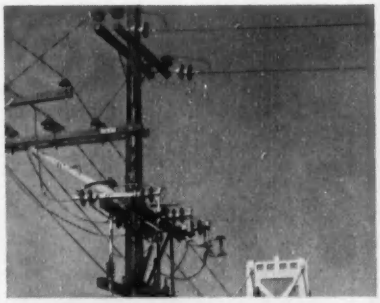
KPF

AIR BREAK SWITCHES

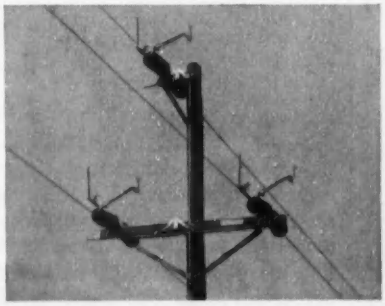
Standard for nearly half a century



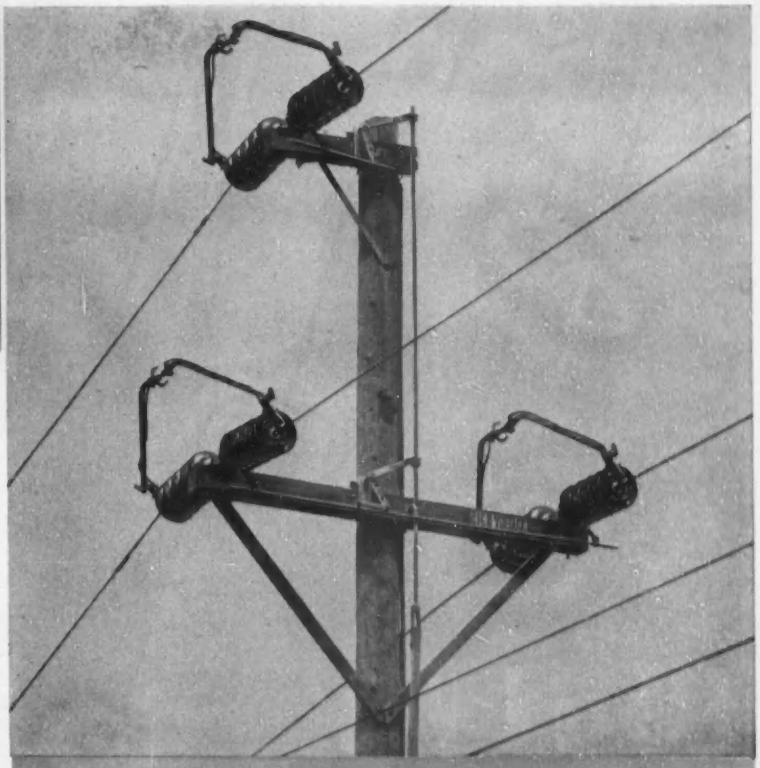
Installing KPF Type A-202 switch hot on 12 kv line. KPF phase units are shipped completely assembled, ready for quick installation.



Horizontal-mounted KPF Type UF-2 switch in metropolitan service (P.G.&E., San Francisco). Versatile KPF switches operate equally well with or without line tension.



KPF Type S-205 switches with inexpensive Quick-Break attachment on 60 kv rural transmission line. Switch shown in open position.



Basically different switch design proven in decades of service with leading utilities

Service-proved KPF switches look different because they *are* different.

Their simple, sturdy design insures freedom from mechanical failure or lubrication worries, and virtually eliminates maintenance. Self-aligning silver surfaced blades operate smoothly despite severe ice or crossarm warpage conditions. Installation is fast and economical—switches are bolted directly to crossarms on the ground or in the air. No separate strain insulators or extra crossarms are required; integral insulator stacks readily adjust to line sag.

KPF switches have been used for almost 50 years on lines ranging from 7.5 to 110 kv. Tens of thousands are in use today by Pacific Gas & Electric, Southern California Edison, Minnesota Power & Light and other leading power companies throughout the world.

For the world's simplest, surest, lowest cost air break switch, specify KPF—standard for nearly 50 years.

New catalog gives complete specifications, detail drawings, installation information.

KPF ELECTRIC COMPANY

1624 East Alpine Avenue, Dept. E-1, Stockton 5, California

JOSLYN

*Apitong Braces

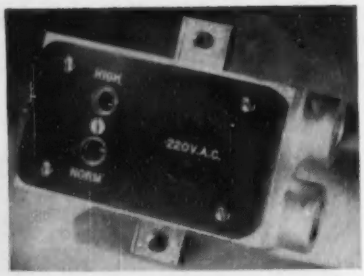
Replace standard 28" steel braces so that the full impulse insulation strength of the wood crossarm may be utilized.

- 6-Lb. Pressure Penta treated
- *Spring-tight* metal fittings
- Vibration and Static-proof

*Apitong is a tough, uniform *tropical* wood, imported from the Philippine Islands and used for years in Joslyn Apitong Wood Strain Insulators.

JOSLYN

Executive Offices
20 NORTH WACKER DRIVE, CHICAGO
BRANCH OFFICES IN PRINCIPAL CITIES



tion box having conduit fittings.

Model 961 indicates a low of 95 to 105 v and a high of 130 to 140 v. Model 960 indicates a low range of 190 to 210 v and a high of 235 to 255 v. Test jack receptors are provided for checking voltage with a meter at any time. Glow lamps are of the non-filament type and are said to be unaffected by extreme vibration.

Industrial Devices, Inc, Edgewater, N. J.

Loom Switch

A new loom switch is said to be completely lint and dust tight and adaptable to loom, wall, or pedestal mounting. It has a die-cast aluminum slide mechanism that is built into the cover to engage the toggle handle. The slide is sealed snugly by spring pressure against a cotton-felt gasket. A cork-neoprene gasket lines the inside edge of the cover to keep lint out. Saddle-type terminals, straight

through wiring, and ample wiring space are claimed to speed installation. **General Electric Co, 1 River Rd, Schenectady 5, N. Y.**

Cable Puller

A new machine for pulling cable can be operated in any position for either pushing or pulling purposes. It pushes 25 ft of fish tape per min around five 90-deg bends, stopping automatically if conduit is obstructed. It will also pull 15 ft of wire per

min into ¾ to 2-in. conduit with a force of 1,200 lb.

The machine provides 175 ft of 0.06 x 0.25-in. usable tape and operates on 115 v, ac or dc. It is attached to conduit by means of brackets. Supports hold the 65-lb machine in vertical, horizontal, or angle positions.
Barth Corp, 12650 Brookpark Rd, Cleveland 29, Ohio

Electrostatic Cleaner

A new ceiling-suspended electrostatic air cleaner may be adopted quickly to any forced-air heating system or residential air-conditioning plant. It is said to remove 90% of all airborne dust and pollen. Model PH-122 weighs 200 lbs, handles up to 1,200 cu ft of air per min, has water and drain line connections for washing away accumulated dirt, and operates from a 115-v ac line.
Westinghouse Electric Co, 200 Readville St, Hyde Pk, Boston 36, Mass.

JOSLYN
*Apitong Braces
Braces are conveniently packed in cartons containing 10 pairs. Both members are the same—no rights or lefts.
• 1-piece threaded metal fittings
• Special washer-head bolts
• Stock No. J5526 denotes 1 pair
*Ask your Joslyn Representative for a free sample.
JOSLYN
Executive Offices
20 NORTH WACKER DRIVE, CHICAGO
BRANCH OFFICES IN PRINCIPAL CITIES

ELECTRONIC TELEPHONE LICKS NOISE!

MODEL NO. 100

*The GAI-PHONE

MAKES COMMUNICATION POSSIBLE
IN EXTREMELY NOISY AREAS.

- NO BOOTH REQUIRED.
- SURPRISINGLY LOW COST.
- PROVED PERFORMANCE.
- RUGGED LONG-LIFE CONSTRUCTION.
- OPERATES AS CONVENTIONAL TELEPHONE.
- EASILY INSTALLED IN EXISTING TELEPHONE CIRCUITS.

GAI-TRONICS CORPORATION
A SUBSIDIARY OF GILBERT ASSOCIATES, INC., ENGINEERS AND CONSULTANTS
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MORE NEW PRODUCTS
about which you should know

Luther Corp, P. O. Box 513, Williams Bay, Wis., announces a new engine-powered **chain saw** available with 14 to 30-in. cutter bars . . . Bustin Firm-Grip Grating Co, Dover, N. J., has a **grating** with half diamond openings that provide safe comfortable walking.

Yosemite Chemical Co, 1040 Mariposa St, San Francisco 7, Calif., announces a new **non-chlorinated cleaner** for electrical parts . . . Beckman Instruments, Inc, 220 Pasadena Ave, South Pasadena, Calif., has a special expanded scale **voltmeter** for measuring transformation ratios of transformers, synchros, and resolvers.

CATALOGS • BULLETINS

● **SCHOOL RELIGHTING:** A 24-page case history report, OD-599, covers the how and why of relighting the Rockford, Ill., school system. Day-Brite Lighting Inc, 16 North 9th St, St Louis 1, Mo.

● **THERMOCOUPLES:** A complete line of thermocouples, radiation detectors, and resistance bulbs are covered in TC-10. Information on protection tubes, lead wire, and other accessories for use with indicating, controlling, and recording instruments of any make is provided. Wheelco Instruments Div, Barber-Colman Co, Rockford, Ill.

● **LIGHT DIMMING:** A 12-page bulletin, D 651PS, on packaged light dimming of 2,000 to 12,000-w equipment for churches, schools, auditoriums and other public places is available. Superior Electric Co, Bristol, Conn.

● **ELECTRIC BROODERS:** An improved line of infrared heat lamp brooders for chicks, young pigs and lambs with mounting and shielding changes is covered by Catalog 130-54. Steber Manufacturing Co, Broadview, Ill.

● **TELEVISION FOR REMOTE TOWNS:** A bulletin, 2R8612, describes how television reception in fringe areas or deep valleys can be improved. Engineering Products Dept, RCA Victor Div, Camden 2, N. J.

● **SILICONE PRODUCTS:** The 1953-54 reference guide, form 1-104, describes many silicone products. Technical Information Service, Dow Corning Corp, Midland, Michigan.

● **WIRE, CABLE, CONDUIT CODE CHANGES:** A wall chart shows the new 1953 changes in the wire, cable, and conduit section of the National Electrical Code. Triangle Conduit & Cable Co, Inc, Dept 12, New Brunswick, N. J.

● **FUSE LINKS:** A bulletin, 104-C, for achieving accuracy in fuse link design for optimum fusing performance has been announced. W. N. Matthews Co, 3850 Delor St, St Louis 16, Mo.

TRANSFORMERS?

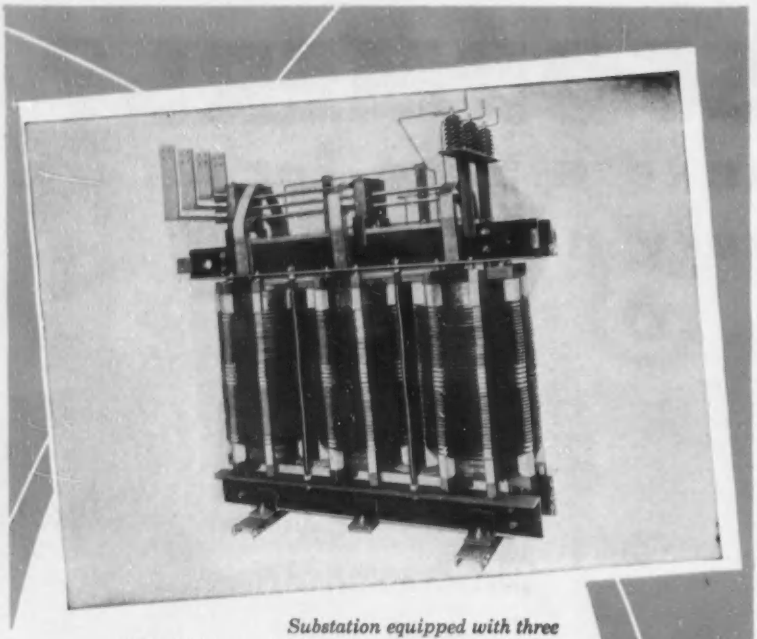
we make a type for every need at Central

and every one is tops in quality and dependability!

TRANSFORMERS
Sizes from 3 KVA to 10,000 KVA, up to 115 KV primary class.

PINE BLUFF, ARKANSAS
SALES OFFICES IN PRINCIPAL CITIES

CTC Central



Substation equipped with three 1250 KVA single-phase Stockwell transformers.

EVERY STOCKWELL TRANSFORMER is the result of specialized research and sound design. Rigidly controlled materials and modern production facilities are additional guarantees of the quality of our products.

Our field organization and our staff of application engineers at Akron will be glad to help you on all your transformer and substation problems.

STOCKWELL

TRANSFORMERS

DESIGNED FOR YOUR REQUIREMENTS

STOCKWELL TRANSFORMER CORP.

AKRON, OHIO

OIL-FILLED, DRY TYPE, and ASKAREL-FILLED DISTRIBUTION AND POWER TRANSFORMERS

3-1

● **PHENOLIC RESIN LAMINATES:** Two series of laminated plastics, XXXP-300, XP-400, are covered by a bulletin that tabulates electrical properties, water absorption, dimensional stability and staking qualities, power factor, and flame retardance. Taylor Fibre Co, Norristown, Pa.

● **AC MOTOR STANDARDS:** An 18 x 24-in. wall chart shows the comparison between old and new NEMA standard dimensions for ac motors from 1 to 30 hp. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

● **TELEVISION FOR INDUSTRY:** Closed-circuit industrial television and equipment is covered by a new brochure entitled "Supervision by Television." Industrial Products Section, RCA Victor, Camden 2, N. J.

● **METAL DETECTOR:** Detection of magnetic and non-magnetic metals in food, plastics, paper, rubber, textiles, coal crushed stone, etc is covered in Bulletin 32 on miscellaneous non-destructive testing instruments. Electronic micrometers and electronic pressure gages are also included. J. W. Dice Co, 1 Engle St, Englewood, N. J.

● **TRUCK BODY:** Bulletin 931 covers the 5000 WD two-man truck body for line crews that has provisions for hole digging and pole setting equipment. Body Division, York-Hoover Corp, York, Pa.

● **HYDRAULIC-MAGNETIC OVERLOAD RELAY:** Bulletin 5101A describes the hydraulic-magnetic operating principle applied to overload relays and shows the principle in graphic form with data on the hermetically sealed time element. Heinemann Electric Co, 324 Plum St, Trenton 2, N. J.

● **FURNACE CONTROLS:** Complete control systems and specifications for electric and fuel fired furnaces, ovens, dryers, and kilns are covered in a 48-page catalog. P1260. Bristol Co, Waterbury 20, Conn.

● **CLEANER FOR STACK GASES:** Latest advancements in the recovery of dusts, flyash, fumes, mists, fogs, or other suspensions in stack or process gases are covered in a 40-page booklet on Cottrell precipitators. Western Precipitation Corp, 1016 W. Ninth St, Los Angeles, Calif.

● **ELECTRIC HEATERS:** Numerous types of electric heating elements, control equipment, and data for calculations are covered in this catalog. Industrial Engineering & Equipment Co, 711 South Theresa Ave, St Louis 3, Mo.

● **OSCILLOGRAPH:** Instruments with 6 or 12 elements and providing simultaneous viewing with recording of traces are described in Bulletin GEC-449B. General Electric Co, Schenectady 5, N. Y.

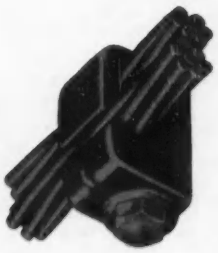
● **HOT LINE REPAIR:** Techniques for making hot line repairs along with a complete line of tools are detailed in a 72-page pocket book for on-the-job use. James R. Kearney Corp, 4236 Clayton Ave, St Louis 10, Mo.

● **CONVEYOR WEIGHT METERS:** Continuous weighing, totalizing, and recording rate of loose material flow on a conveyor belt, is covered in Bulletin 1018-3 on the Trans-Weigh Belt Meter. Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Pa.

● **BILLING AND ACCOUNTING:** A new commercial electronic decimal calculator, Type 650, for customer-billing is covered by IBM form 32-6153-0. International Business Machines Corp, 590 Madison Ave, New York 22, N. Y.

● **AIR DRYERS:** Information on equipment for reducing moisture content in air or other gases is contained in Bulletin 16.0.081. J. F. Pritchard & Co, Equipment Div, 210 W. 10th St, Kansas City 5, Mo.

There's a *One-piece...Vise-type* *FARGO CONNECTOR* to meet your "specs" *plus* performance...ease of installation ...overall economy.

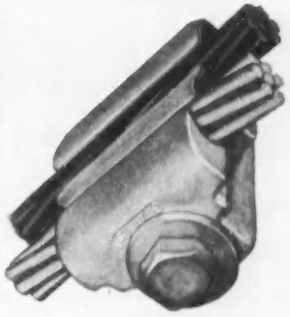


THE "5000 Series" FOR COPPER CONNECTIONS: Fargo's Standard Connector—obtainable in bronze or plated bronze. Its vise-type construction provides an ideal . . . vibration proof contact —high in conductivity . . . with high compression at low wrench torque. It is easy and safe to handle . . . requires no attention after installation—can be used over and over again. Available from #8 sol. to 1000 MCM.

THE "8000 Series" FOR ALL-PURPOSE CONNECTIONS: This series utilizes a bronze body and copper spacer for copper conductors. Also plated for all-purpose use and for friendly contact with aluminum. Liberal spacer provides adequate conductor spacing minimizing galvanic corrosion of dissimilar conductors. Fits wide range of conductor sizes—thus reducing the number of connector sizes to be stocked.

THE "7000 Series" HEAVY DUTY CONNECTOR: This series is designed with wide jaw contact areas and has better-than-conductor resistances. It is equipped with a heavy copper spacer that is massive in design for better heat dissipation during faults. Available in bronze for copper connections—or plated for all-purpose use in sizes from #6 to 1000 MCM. Also available in aluminum for Al. to Al. or Al. to Cu. in sizes from 350 MCM to 1000 MCM.

THE "9000 Series" FOR ALUMINUM-TO-ALUMINUM or ALUMINUM-TO-COPPER. This series features all-aluminum construction with wide jaws for better contact resistances . . . low relaxation or cold flow of conductors. Massive design provides for better heat dissipation under faults — like metal contacts increase service life. Available for aluminum and copper combinations in sizes ranging from 8 sol. to 397.5 MCM.



...*"built like a vise — grip like a vise."*

Ask your Line Material Field Engineer to give you complete details.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

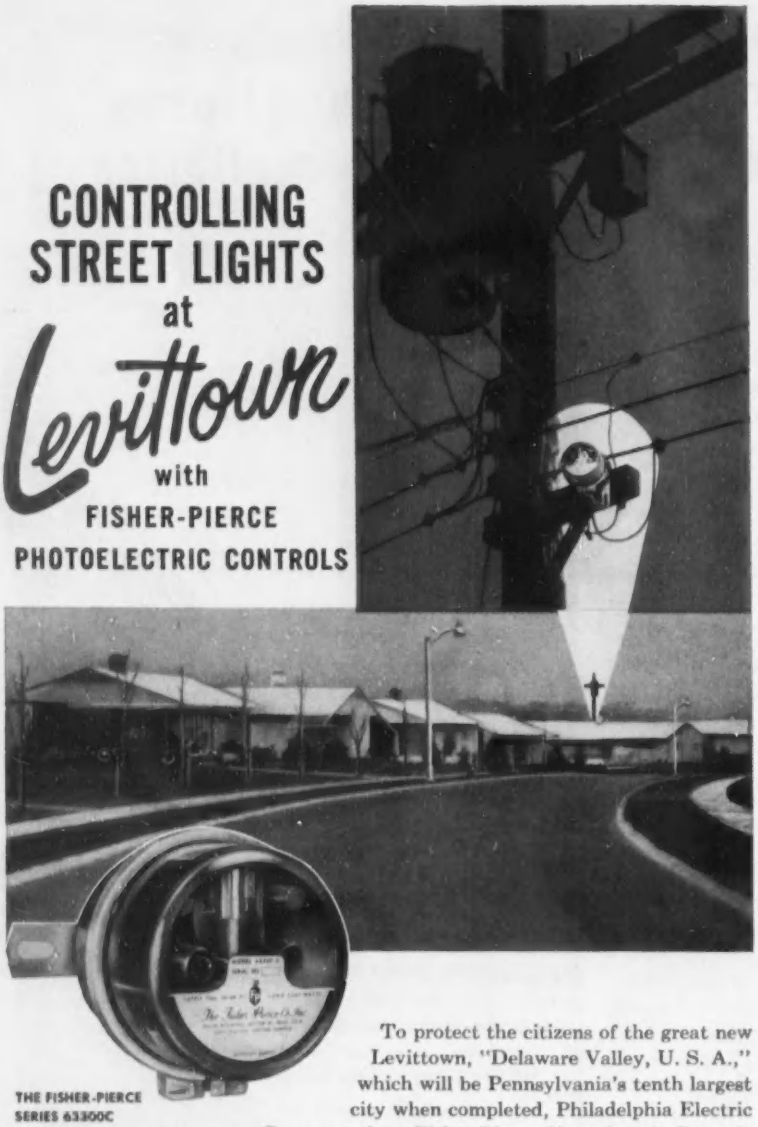
Distributed by

LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

Milwaukee, Wisconsin

CONTROLLING STREET LIGHTS at Levittown with FISHER-PIERCE PHOTOELECTRIC CONTROLS



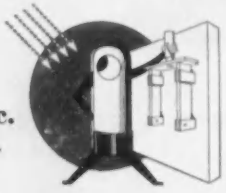
THE FISHER-PIERCE SERIES 63300C
The latest unit in a proven line of photoelectric controls for street lighting

To protect the citizens of the great new Levittown, "Delaware Valley, U. S. A.," which will be Pennsylvania's tenth largest city when completed, Philadelphia Electric Company chose Fisher-Pierce Photoelectric Controls for positive all-season control of street lighting. The *instant* that daylight falls below a safe level in Levittown, F-P Controls automatically turn street lights on, regardless of time of day, season, or weather conditions.

Fisher-Pierce maintains leadership in photoelectric street lighting control because each F-P unit is built to meet the rigid standards of reliability and quality demanded by utility engineers. For eight years, F-P Controls have been proven in use by hundreds of utilities in thousands of installations.

If you are considering modernizing your street lighting or are concerned with street lighting problems, consider the Fisher-Pierce Photoelectric Control.

WRITE FOR BULLETIN



The FISHER-PIERCE CO., Inc.
82 Pearl St., So. Braintree, Boston 85, Mass.

EXPORT: PHILIPS EXPORT CORP. 100 E. 42nd STREET NEW YORK 17, N.Y.

IN CANADA: NORTHERN ELECTRIC CO., Ltd.

● **GE BULLETINS:** The following bulletins have been announced by General Electric Co, Schenectady 5, N. Y.:

GEC-1211 Street lighting series-circuit transformers and control
GEA-5975A Features of constant current transformer
GEA-5712 Multiple-generator sectional drives for paper machines
GEA-5560 Drives for paper finishing and converting machines
GEA-5947 Photoelectric side register control systems
GEC-1210 Multiple-circuit control equipment for street lighting
GEA-5141B Photoelectric controls for outdoor lighting
GET-922F Fluorescent lamps and starters and ballast characteristics
GEC-983A Charts for selection of ballasts
GEA-5964 Dc runout table and coiler motors
GEA-6012 Enclosed motors, 1-30 hp
GEA-6013 Drip-proof motors, 1-30 hp
GEA-6027 Gear-motors, 1-30 hp, 780 to 5.7 rpm output

● **NETWORK ANALYZER:** A 6-page bulletin on Type 250-A Complex Plane Analyzer describes the instrument's theory and operation, and lists specifications and features. Technology Instrument Corp, Main St, Acton, Mass.

● **ALLIS-CHALMERS BULLETINS:** The following bulletins have been announced by Allis-Chalmers Manufacturing Co, 932 S. 70th St, Milwaukee, Wis.:

11B6285B Load Center Substations
21B7977 Distribution Regulators, Type JFR
18B7993 Magnetic Air Circuit Breaker

● **HIGH VOLTAGE MOTOR CONTROL:** A 16-page bulletin, GEA-5409, describes Limitamp high-voltage motor control's operation and application, by photographs, charts and diagrams. General Electric Co, Schenectady 5, N. Y.

● **CURRENT-LIMITING REACTORS:** Uses and characteristics of cast-in-concrete reactors for single-and three-phase circuits of 34,500 volts and below are covered in an 8-page bulletin, GEA-976C. General Electric Co, Schenectady 5, N. Y.

● **ALUMINUM-JACKETED PIPE:** Advantages of aluminum wrapped cellular glass insulation and the economies made possible by the factory applied jacket are covered by Bulletin F1-102A. Pittsburgh Corning Corp, 1 Gateway Center, Pittsburg 22, Pa.

● **SHEETS ON ACSR:** Holders of the Reynolds manual, "Aluminum Cable, Steel Reinforced . . . ACSR", can get information on strandings of 18/1 and 24/7 by writing for the 10-1-53 ACSR releases. Reynolds Metals Co, 2500 S. Third St, Louisville 1, Ky.

● **POWER PIPING:** Data for the application and installation of carbon, alloy, and stainless steel pipe has been issued in card form, TDC-138A. Tubular Products Div, Babcock & Wilcox Co, Beaver Falls, Pa.

● **SWITCHBOARD INSTRUMENTS:** Improved legibility of scales under all conditions of lighting is a feature of the switchboard instruments covered by 24-page Bulletin GEC-218C. General Electric Co, Schenectady 5, N. Y.

● **SOIL RESISTANCE MEASUREMENTS:** Theory and methods of soil resistivity measurement with brief discussion of geophysical prospecting by electrical methods is covered by Bulletin 1-1. Associated Research, Inc, 3760 W. Belmont Ave, Chicago 19, Ill.

● **POWER LINE CARRIER:** Carrier equipment for relaying, telemetering, supervisory control, and voice communication is covered in Booklet B-5873. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Consider the Atomic Power Plant...

when critical piping is the order!

TODAY'S OPERATING TEMPERATURES and pressures so closely approach the maxima for available piping materials that nothing can be left to chance . . . to empirical design. And detailed mathematical calculations to determine all the stresses in a modern, complicated piping system is a herculean task.

However, Kellogg's model tester, employing patented electrical measuring heads (illustrated) fulfills the need for rapid, exact testing for all forces and moments in a proposed system. An added advantage in this method is that changes in design indicated during testing can be immediately incorporated in the model—and testing continues reflecting the effect of the changes in design on all other phases.

While Kellogg's model tester has been used primarily on central station systems (piping arrangements for a total of some 4,700,000 KW's have been investigated to date), it is no wonder that the equipment was again called upon when the power plants for the first atomic submarines were being designed.

All the facets of these extremely critical piping systems—considerably complicated by the confined space within submarines—were thoroughly checked and rechecked on the model tester to assure the operational soundness of the design.

This approach to the problems of high-pressure, high temperature piping—the desire to be sure, to explore new testing techniques, and to constantly improve welding procedures—is Kellogg's basic stock in trade. Many power station designers and utility companies also say it's the basic reason why they repeatedly specify "*critical piping by Kellogg.*"

NEW K-WELD PROCESS . . .

Send for descriptive literature about the new K-Weld process which assures complete penetration without the use of backing rings.

These leading companies are among the many major producers of power who use M. W. KELLOGG POWER PIPING . . .

- Niagara Mohawk Power Corp.
- Palestine Electric Corp., Ltd. (Israel)
- Philadelphia Electric Co.
- Public Service Co. of Northern Illinois
- Public Service Electric & Gas Co. of N. J.
- Societe Anonyme John Cockerill (Belgium)
- Societa Edison (Italy)
- Societe Financiere De Transports Et D'Entreprises Industrielles (Sofina) (Belgium)

OTHER FABRICATED PRODUCTS including: Pressure Vessels . . . Vacuum Vessels . . . Fractionating Columns . . . Drums and Shells . . . Heat Exchanger . . . Process Piping . . . Bends and Headers . . . Forged and Welded Fittings . . . Concrete and Radial Brick Chimneys

For further information, details of methods, etc. contact

FABRICATED PRODUCTS DIVISION

THE M. W. KELLOGG COMPANY

225 Broadway, N. Y. 7, N. Y.

or offices in Jersey City, Buffalo, Los Angeles, Tulsa, Houston, Toronto, London and Paris

KELLOGG — a subsidiary of PULLMAN INCORPORATED

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POWER PIPING

LETTERS TO THE EDITOR

Like the Massachusetts group (above) Philadelphia's AIEE section is . . .

. . . Talking Up Engineering Careers

To the Editor:

Your issue of Oct. 12 carries an interesting article entitled "The Engineers Try Radio Recruiting," which outlines the activities of the Massachusetts Society of Professional Engineers in promoting the interests of engineers by furnishing material and speakers for a program broadcast over station WEEI in Boston. This is a most praiseworthy activity and the society is to be congratulated.

It is only fair to point out that the Philadelphia Section AIEE, with the cooperation of FM station WFLN (95.7 MC), ran a similar weekly program from April 1 to July 1, 1953, under the general title of "Meet the Engineer."

A brief article, together with photographs taken at the first recording, appeared in the May issue of Electrical Engineering.

After the summer interval, this program was resumed in September and will continue each Wednesday—a new topic being discussed each week. The broadcasts so far in this series have been devoted to "History of Engineering," "Women in Engineering," "Do I Have What It Takes to be an Engineer?" and others. These are to be followed by discussions of the role of the engineer in various industries and utilities. Some of the talks are in the form of a colloquy, others are a straight narrative.

For a number of years the Philadelphia section of the American Chemical Society has conducted a weekly program along similar lines, over the same station, under the general title "Outlines in Chemistry."

It is our purpose to bring to the attention of the general public the mission of the engineer and we believe it to be a worthwhile effort. Engineers should do more to advance their standing in the community, thereby inducing the younger people to study engineering.

Should you be interested, this committee will be pleased to furnish whatever material we have in promoting this effort among the engineering profession as a whole.

M. L. Stoughton, Chairman
Radio Program Committee
Philadelphia Section
American Institute of
Electrical Engineers

Isolating the Energy

To the Editor:

With reference to the Dec. 7 issue, I was interested in the "Technical Note" which said, "Line work on 12 kv is reportedly accomplished as fast with live-line tools as with rubber gloves. . . ."

The procedure was given consideration some years previous and it was the consensus that under average operating conditions work could be accomplished with sticks more economically and efficiently than with the proper application of rubber protective devices. Naturally, if we have efficiency and economy, we have a safe job.

We endeavored to introduce the utilization of sticks on some 4-kv work in an area in which the circuits were operated at 4 kv, but the construction was 12 kv—the thought being it would be a practical way of trying out the new method. It did not take, however, for several reasons. The personnel was unaccustomed and, therefore, reluctant to accept the new innovation. Complaints were the heavier copper and different positions. Preparation of special 4-ft sticks for tryout was introduced. One point in this was impractical because it brought the personnel in such close proximity to the energized parts that the objective of safety was not accomplished.

There is no doubt in my mind that the utilization of sticks can be had regardless of voltage under several conditions. I am a firm believer that the main objective of reducing the number of serious accidents in our industry can be brought about by isolation as well as insulation. By isolation I mean the farther we stay away from the circuit the less chance the human will make a contact.

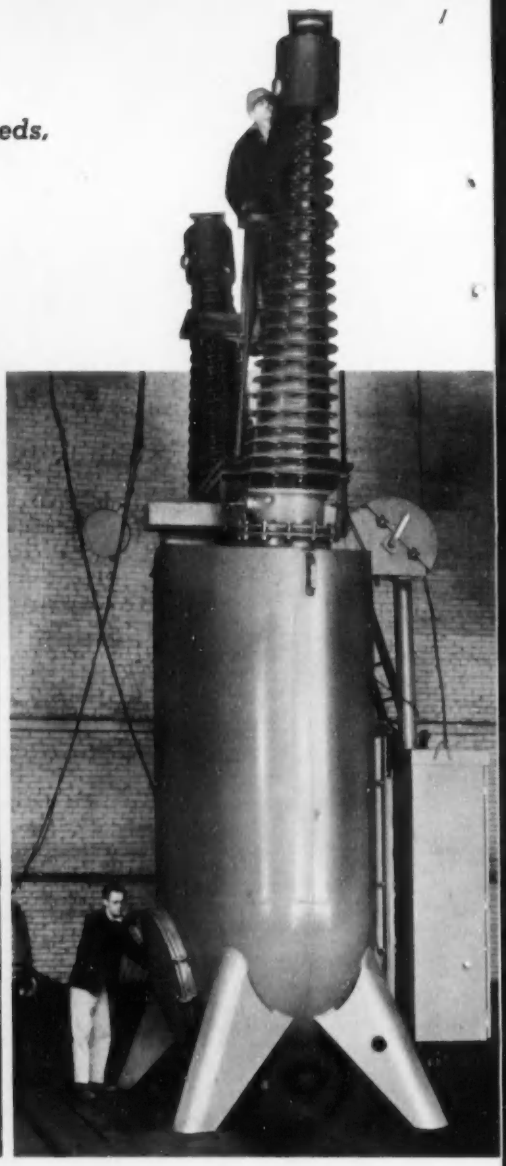
Edward C. Hunt
Safety engineer
Pacific Gas & Electric Co
San Francisco

Meet C. F. Wagner,*
Westinghouse Consulting Engineer, who will give you, on the following pages, a highly informative tour designed to help you in the . . .

Application of equipment in higher capacity transmission systems

*Charlie Wagner, 1952 winner of the Edison Medal for his "distinguished contribution in the field of power system engineering", has spent over thirty years in the field of transmission engineering and insulation coordination — both in this country and abroad. He and other experts on the Westinghouse Utility team present some important facts.

"Power breakers are crucial in transmission expansions. Dr. W. M. Leeds, Manager, Power Circuit Breaker Development, explains . . ."



How we keep breaker capacity ahead of your transmission requirements

Higher concentrations of power — greater flexibility of system operation — higher transmission voltages — are possible only because of higher capacity breakers. To date, the power circuit breaker has not been a limiting factor in transmission system design. We don't think it will be because the High Power Laboratory enables us to keep up with your farsighted transmission system designers.

Early this year, we announced "Big Ben", the world's largest breaker, with 25,000 mva interrupting capacity at 330 kv. "Big Ben" takes its place beside a whole array of high-capacity breakers: 15,000 mva, 230 kv; 10,000 mva, 161 kv; 10,000 mva, 138 kv; 3500 mva, 69 kv frame mounted; 2500 mva, 34.5 kv; and 2000 mva, 18 kv.

Some of these represent high-current interrupting problems, others high-voltage interrupting problems. The solutions to both have been demonstrated in the High Power Laboratory.

YOU CAN BE **SURE**...IF IT'S

These design factors boost breaker capacity

Here are some of the specific factors that enable us to meet your demands. First, the "De-ion®" grid. Heavy current arcs generate high-pressure oil jets that blast the arc out. Light current arcs are interrupted by mechanically induced oil flow. All ratings of current are completely interrupted within 3 cycles. But the oil and gas forces are balanced so that high stresses don't react on the bushing or shift contact alignment.

Breakers 230 kv and larger are of the Watchcase* design using the proven dead-tank construction. Oil content is reduced to less than one-half that of the conventional round-tank design. This shape is possible only because the De-ion grids keep the tank pressures low during interruption.

Surge suppressor tanks — air cushions — are used on all 10,000,000-kva, round-tank breakers. These absorb pressure shocks, reduce impact and eliminate rebound.

Operating mechanisms have also kept pace. A single AA-7, AA-10 or AA-14 pneumatic operating mechanism operates all three poles of a breaker, simultaneously. All are mechanically trip free to insure fast parting of contacts under any condition of opening, yet permit reclosing as fast as your system requires.

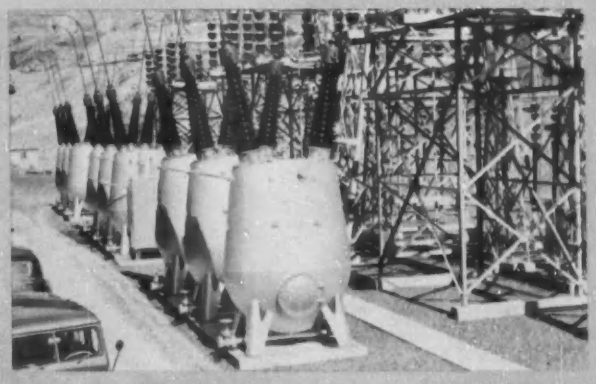
The condenser bushing, using the sound electrical principle of capacitance voltage division, insures long-life, corona-free and radio-interference-free operation at all voltages.

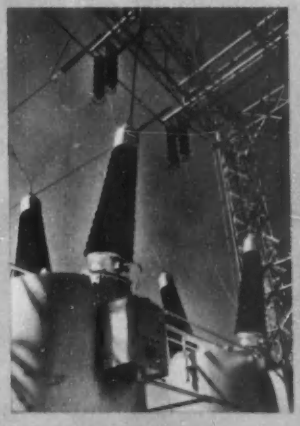
And best of all, most older breakers can be modernized for higher capacity at a fraction of the cost of new breakers.

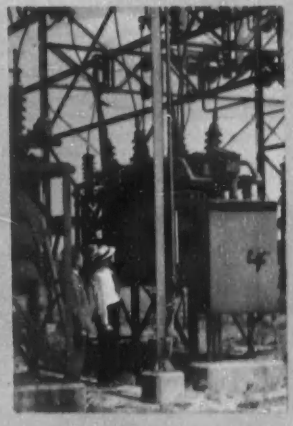
Keep close to Westinghouse for today's or future breaker requirements. Write for descriptive booklets — B-4662, B-3462, DB-33-805 and DB-33-820. J-60826

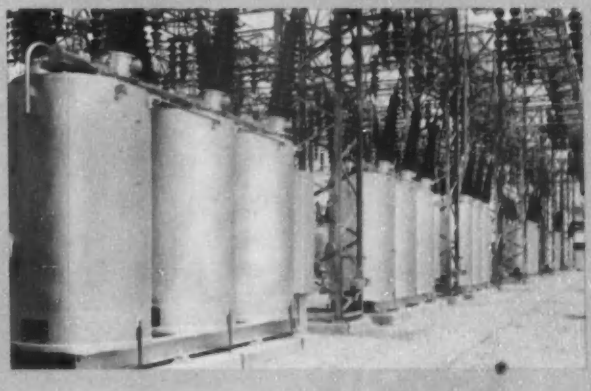
*Trade-Mark

"Westinghouse can build breakers to meet every transmission need"



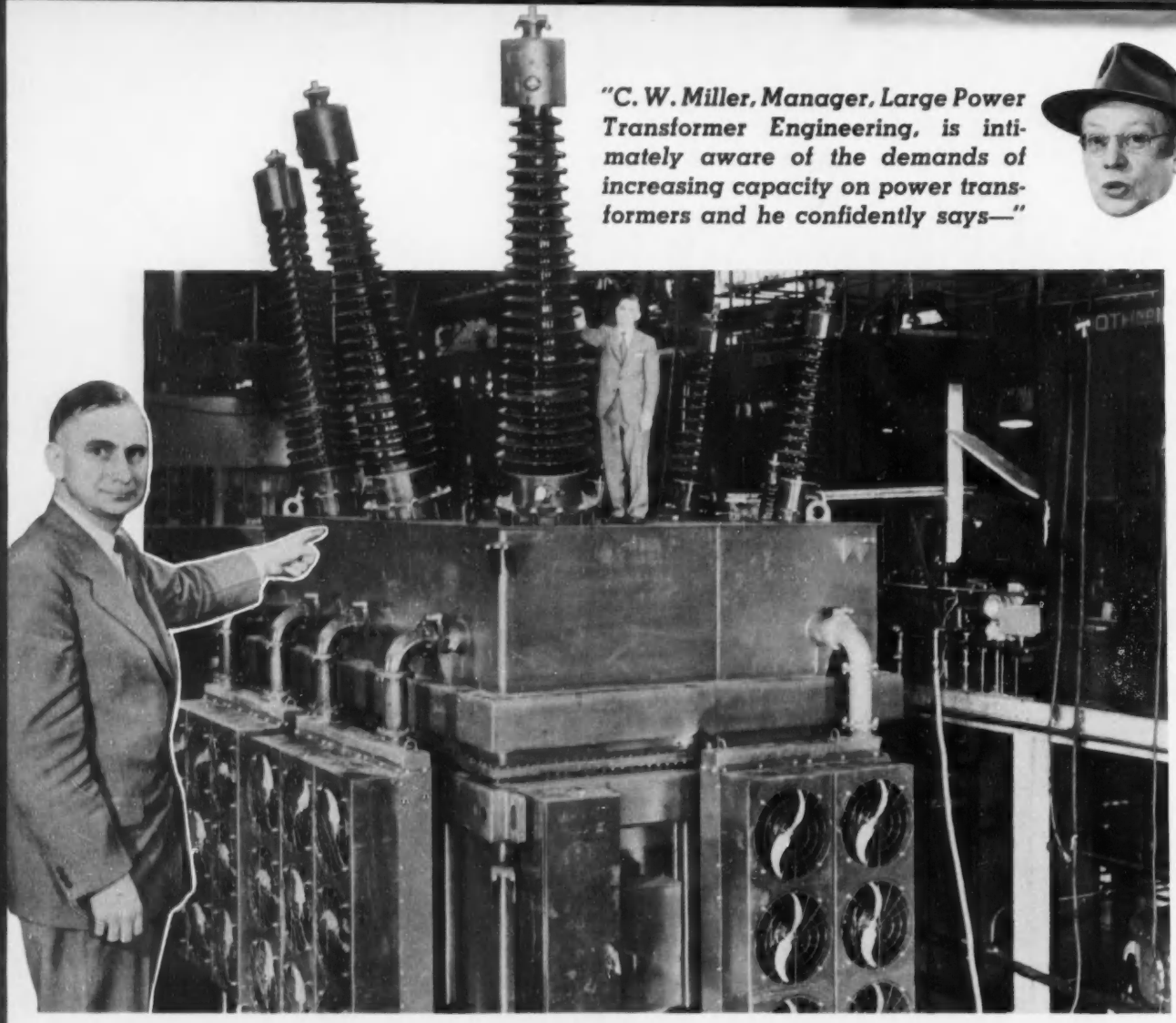






Westinghouse

"C. W. Miller, Manager, Large Power Transformer Engineering, is intimately aware of the demands of increasing capacity on power transformers and he confidently says—"



Westinghouse Form-Fit design is your answer to higher capacity transmission problems

As the need for higher and higher transmission capacities develops, there's only one practical transformer answer: larger and larger single-unit, Form-Fit power transformers.

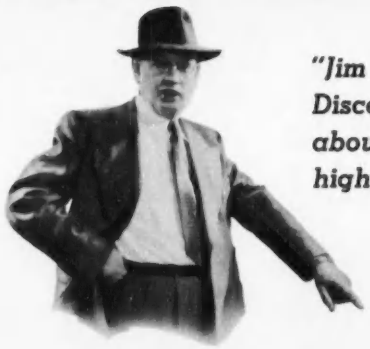
Why? Because the Form-Fit design can handle larger blocks of power in a smaller and lighter unit than any other known form of construction.

The barrier to higher rated transformers is, of course, transportation limitations. But consider this: The largest rating yet built, 190,000 kva; the highest commercial voltage rating yet built, 330 kv (illustrated); the highest voltage test units in existence, 500 kv, are *all* of Westinghouse Form-Fit design. Even now, units of over 300,000 kva are feasible and the end is nowhere in sight.

The inherently superior mechanical, thermal and dielectric characteristics of the Form-Fit design always result in reduced size and weight, plus the utmost in reliability. What are your requirements? For additional information on Westinghouse Power Transformers write for booklet B-4142-A.

J-70692

YOU CAN BE **SURE**...IF IT'S



"Jim Owens, Supervising Engineer, Disconnecting Switch Section, tells about a major new development for high-capacity lines . . ."

On test: giant new disconnects for 330-kv systems

Mammoth switch is built like its smaller brothers in Westinghouse Type-V line

This is one of the world's biggest disconnects. It will be installed on a 330-kv line — a milestone in high-capacity transmission systems.

With the ultra-high voltage and capacity, these switches had to meet rigid performance standards. But the basic Westinghouse Type-V design, used from 7.5 to 330 kv, proved satisfactory. See why this is so.

Consider corona, a big problem at high voltages. In the Type-V design, the streamlined housing *completely* covers the entire blade-actuating mechanism — eliminating a possible source of corona with hinge end shielding.

This giant switch has only three moving parts on the live side — an exclusive Westinghouse Disconnect feature. Moreover, there is no flexible shunt to wear out or rust away. And there is this major point for those who do not like to get close to one third of a million volts: all bearings, including those on live parts, are lubricated for life.

These switches have shown up superbly in exhaustive tests at our High Voltage and High Power Laboratories at Trafford and East Pittsburgh, Pennsylvania. We urge you to investigate the Type-V line. Write now for booklet B-4241.

J-60827

Westinghouse

"Accuracy is the watchword of Bob Hurst, Manager, Instrument Transformer Section, and he has a good reason why — "

Transmission trends demand the accuracy of Westinghouse Transformers

When voltage goes up, accuracy in current and potential transformers becomes increasingly important. Inaccuracies in metering and relaying equipment could be costly to your operations at any level. At higher voltages, it becomes even more serious. That's why Westinghouse devotes so much time to designing and building instrument transformers of highest accuracy.

An important feature contributing toward high accuracy is the use of finest quality, grain-oriented Hipersil® steel cores. They have high permeability with low losses and exciting current, factors essential for high accuracy.

Such added Westinghouse design features as oxygen-free copper, highest quality coordinated insulation, sealed oil-filled bushings for an absolute airtight construction make Westinghouse High-Voltage Instrument Transformers the best and most accurate on the market.

So when you're confronted with the need to add capacity to your transmission lines, be sure to investigate Westinghouse Instrument Transformers. Their outstanding accuracy will pay dividends in increased reliability of your metering and relaying operations. For more details contact your Westinghouse Representative. J-70693

YOU CAN BE **SURE**...IF IT'S

"Microwave communication and control have many advantages to offer Utilities. Here's Bob Cheek, Assistant Manager of Application Engineering at our Electronic Division, to tell you about them."

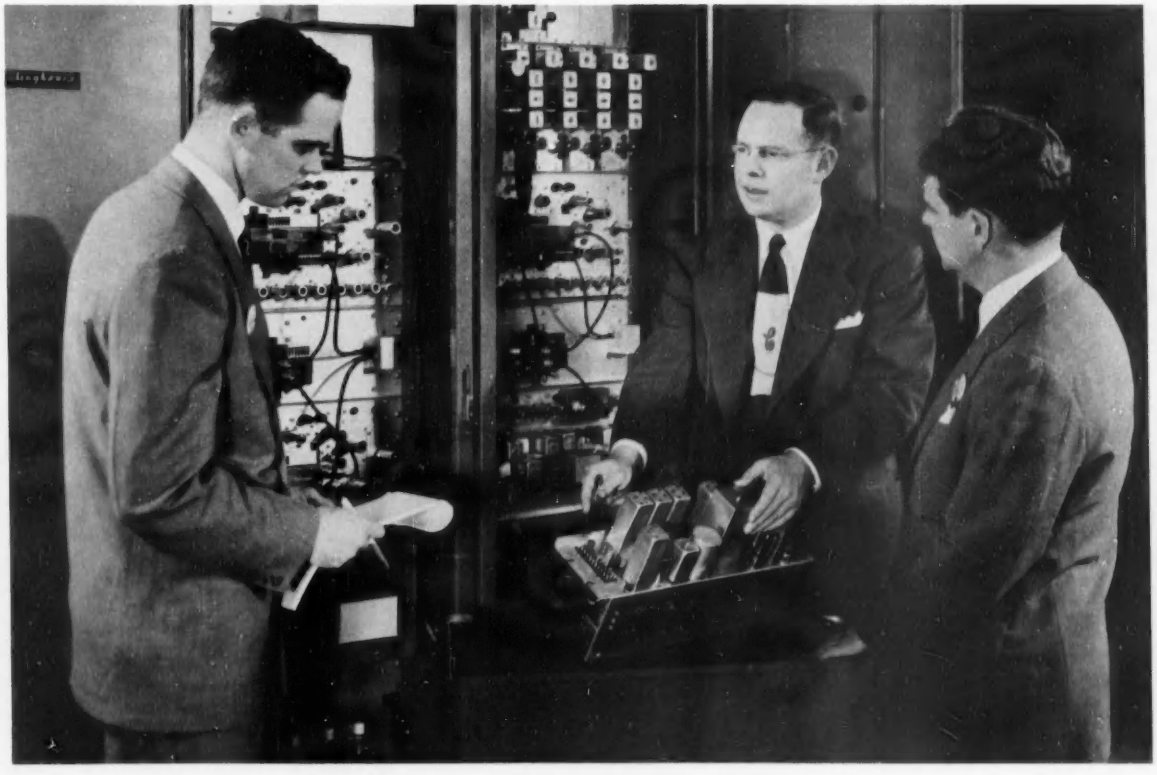
Westinghouse 2000 MC Microwave provides fast, reliable communication and control

As capacity on transmission lines increases, it becomes more and more essential that communication and control be fast and reliable under all conditions. Westinghouse 2000 MC Microwave provides up to 30 voice or 450 telegraphic channels for this necessary speed and reliability.

Electric Utility needs prompted the practical design and system features of Westinghouse 2000 MC Microwave. The multiplexing equipment, of the frequency division type, affords full flexibility of the voice and telegraphic channels. This system works with all types of interconnected equipment, such as relaying, telemetering and supervisory control devices.

Since Westinghouse builds both microwave and power line carrier systems and the end-use equipment which utilizes these systems, we are in a position to give you unbiased recommendations.

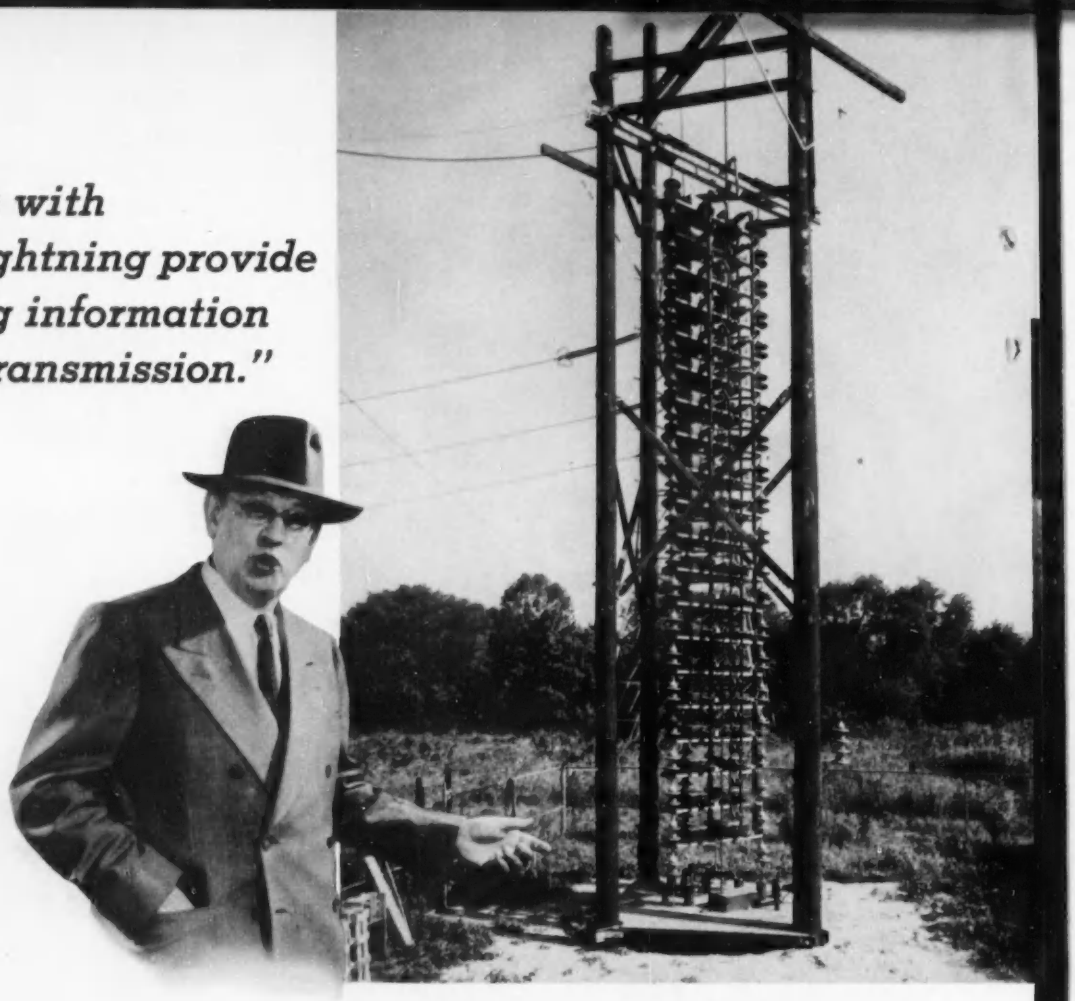
When considering communication problems, check the specific advantages of Westinghouse Equipment. Call your Westinghouse Representative or write Westinghouse Electric Corporation, Communications Section, 2519 Wilkens Avenue, Baltimore 3, Maryland. J-02265



Electrical connections to all panels, including the voice-band panel being pointed out by Bob Cheek, are of the plug-in type for greater flexibility.

Westinghouse

"Field tests with artificial lightning provide engineering information for future transmission."



The 2000-kv surge generator uses the Marx circuit, and consists of 20 capacitor stages in series, with each stage made up of two 50-kv capacitors.

As transmission voltages continue to increase, it becomes necessary to again evaluate design standards which could offset the factor of increasing equipment costs.

At American Gas and Electric's 500-kv experimental lines at Brilliant, Ohio, Westinghouse is sharing with A.G. & E. the challenge of answering that need. The Westinghouse Surge Generator installed at the open end of the two 1.5-mile lines can deliver, into one conductor, positive or negative surges of 1800-kv crest value. The surge can be applied to one conductor or any combination of conductors. The equipment at this site, because it is full scale and includes all the essential components, lends itself to testing at voltages comparable to those produced by lightning in actual systems.

There are many things to be learned from such full-scale field testing. But probably the most important is one of economics. The incremental cost of extra-high-voltage equipment calls for careful coordination of arrester characteristics and equipment insulation in order to maintain the lowest practical margin between protective levels and insulation levels.

Through application of the knowledge gained from this project and many others currently being executed, Westinghouse can assure its Utility customers of practical and economical transmission of larger and larger blocks of power. For further information regarding higher voltage transmission or products presented on preceding pages, call your Westinghouse Representative or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. CP-1005

YOU CAN BE SURE...IF IT'S Westinghouse

TECHNICAL LITERATURE

STRENGTH OF METALS AT HIGH TEMPERATURES—Announcement has been made of "Symposium on Strength and Ductility of Metals at Elevated Temperatures with Particular Reference to Effects of Notches and Metallurgical Changes," sponsored by a joint ASTM-ASME committee. Discaloy, precision-cast alloy X-40, Inconel X, Nimonic 80A, and other heat resisting and stainless steels are included in the literature. This 256-page Technical Publication No. 128 costs $3.25. American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.

TIME SWITCH APPLICATION—A booklet entitled "The Story of the Electric Watchman" is available to familiarize the public with the many uses and benefits of time switches. Time Switch Section, National Electrical Manufacturers Assn, 155 East 44th St, New York 17, N. Y.

ASA TRANSFORMER STANDARDS—Four revised standards for transformers, regulators, and reactors can be obtained from American Standards Assn, Inc, 70 East 45th St, New York 17, N. Y. They are:

C57.10-1953 American Standard Terminology for Transformers, Regulators, and Reactors—no charge

C57.11-1953 American Standard General Requirements for Transformers, Regulators and Reactors—no charge

C57.13-1953 American Standard Requirements for Instrument Transformers and Table of Contents—$1.00

C57.33-1953 American Standard Guide for Loading and Operation of Instrument Transformers—$0.35

PROTECTIVE RELAYING—A 69-page technical volume, GET-1768A, covers relaying for: general practice, ac rotating machines, power transformers, switchgear, transmission lines, subtransmission lines and feeder circuits, dc machines, and miscellaneous applications. Relaying accessories, the R-X diagram, checking performance of relay system, and relay definitions are also included. General Electric Co, Schenectady 5, N. Y.

TEST FOR PENTA IN WOOD—Technical Newsletter No. 7 outlines a new color test for determining the presence of pentachlorophenol in wood. Chapman Chemical Co, Dermon Building, Memphis 3, Tenn.

DC ARC WELDER—Technical Paper A-5348 concerns a redesigned selenium rectifier dc arc welder. Westinghouse Electric Corp, Box 2278, Pittsburgh 30, Pa.

DISTRIBUTION SYSTEM METERING—A 20-page booklet, 401, on the use of measuring instruments to obtain continuous, accurate information at distribution, transmission, and substation points of a system has been published. Sangamo Electric Co, Springfield, Ill.

TRANSFORMER MANUAL—A 9-page manual, T2, is available to guide management, electricians, and maintenance personnel in the proper installation, operation, and care of dry-type transformers. Hevi Duty Electric Co, Milwaukee 1, Wis.

RURAL WATER SYSTEMS—A revised edition of "Manual of Water Supply and Equipment" provides information on installation, operation, and servicing of electric water systems beyond the reach of municipal water mains. The manual costs $1.50. National Association of Domestic and Farm Pump Manufacturers, 39 S. La Salle St, Chicago 3, Ill.

AMPLIDYNE PRINCIPLES AND APPLICATIONS—A 24-page publication, GEA-4053, is available on how amplidynes perform controlling functions and where they are being applied. General Electric Co, Schenectady 5, N. Y.

5000 WD

the New

YORK-HOOVER
TWO-MAN
LINE BODY

model 5000 WD is a sound investment for YOU...

because it will do your line work *at less cost—quicker and safer.*

With complete equipment it will dig the hole and set the pole, *normally in a matter of minutes*, all within full view and control of the truck operator.

Backed by 61 years' *experience* and embodying skillful engineering and honest workmanship, the model 5000 WD body with equipment represents a truly outstanding investment.

Before you purchase any line equipment, make sure you have thoroughly looked into this modern, up-to-the-minute unit by York-Hoover.

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YORK, PENNSYLVANIA
Body Division

Snap-on VACUUM GRIP PLIERS ...the right pliers for every job!

● Choose from more than 30 Snap-on types and sizes. Each is built to perform its specific gripping, cutting or twisting function *faster, easier, more safely* than any other pliers. Snap-ons are heat-treated from surface to core and the jaws, cutting edges and joints are locally tempered to exact degree of hardness and toughness for greatest durability. Write for catalogs described above. Snap-on branch warehouses in principal industrial centers offer direct service to industry everywhere.

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8108-A 28th Avenue, Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation

ASBESTOS TEXTILES HANDBOOK—An 84-page "Handbook of Asbestos Textiles," covers the nature, mining, milling, grading, processing, and ASTM Specifications and methods of testing asbestos products. Copies cost $1.00 each. Asbestos Textile Institute, School of Ceramics, Rutgers University, New Brunswick, N. J.

NEMA MAGNETIC WIRE STANDARDS—Publication of the following standards has been announced by National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.:

MW1-1953 American Standard Enamel-Coated Round Copper Magnet Wire—$0.50

MW11-1953 American Standard Cotton-Covered Round Copper Magnet Wire—$0.35

MW21-1953 American Standard Silk-Covered Round Copper Magnet Wire—$0.35

MW22-1953 American Standard Nylon-Fibre-Covered Round Copper Magnet Wire—$0.35

COAL-MINE MOTOR DRIVES—Motors, controls, and gearing applications in modern coal mining are analyzed in a 26-page booklet, B-5619. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

SPECTROCHEMICAL ANALYSIS—A 320-page book entitled "Methods for Emission Spectrochemical Analysis" has numerous suggested analysis procedures for metals and certain non-metals. Copies may be obtained at $4.50, or $5.15 with cloth binder. American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.

STRANDED WELDING ELECTRODES—A 12-page booklet on "Stranded Electrode Materials for Airomatic Welding" covers photos of stranding arrangement, welding characteristics, photomicrographs of deposits, and case history applications. Air Reduction Sales Co, 60 E. 42nd St, New York 17, N. Y.

STREET LIGHTING PRACTICE—The 12-page booklet "Street Lighting—A Guide To Good Practice" presents an outline of engineering procedure to obtain efficient, effective, and economical systems for street lighting. Holophane Co, Inc, Street Lighting Dept, Newark, Ohio.

VISCOSITY RECORDER-CONTROLLER—A system which accurately measures viscosity under industrial conditions is covered in Technical Report, TI 27-A-16B. Foxboro Co, Foxboro, Mass.

ELECTRONIC COMPONENTS HANDBOOK—Basic components for building electronic equipment to subdivided circuity, trouble spot telltales, plug-in replacement spares, and check point routing of leads are covered by a new handbook announced by Alden Products Co, 117 N Main St, Brockton 64, Mass. Thumb indexed sections include plug-in components, plugs and connectors, miniature plugs and sockets, CRT and tuning eye sockets, dial lights and sockets, tube cap connectors, test equipment components, power supply components, government spec telegraph keys; molding, wire and cabling, and coil winding services; computor components, production aids and machinery. Use identifying letterhead in requesting any sections or the complete handbook.

LARGE TURBINE-GENERATOR PREFERRED STANDARDS—The 1953 AIEE and ASME standard under the title "Preferred Standards for Large 3600-Rpm, 3-phase, 60-cycle, Condensing Steam Turbine-Generators, (Larger than 10,000-KW Rated Capacity) and Standard Specification Data for Generators for —Condensing Steam Turbine-Generators" has been published. The new standard supersedes the Nov. 1950 issue. Ask for ASME No. 100, Jan. 1953; or AIEE No. 601 and 602, Jan. 1953 from either sponsoring body at 33 West 39th St, New York 18, N. Y.

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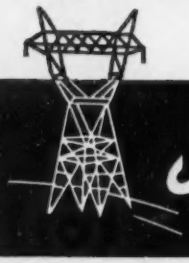
Neoprene Triplex)



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IN THE HEART OF THE SOUTH

NEWS ABOUT PEOPLE

ALLEN S. KING

BERNARD F. BRAHENEY

Allen King Elected President . . .

. . . of Northern States Power to succeed the late Bernard F. Braheney. Utility's top official is former executive vp

Allen S. King, executive vice president of Northern States Power Co, has been elected president and a director to succeed Bernard F. Braheney, who died Jan. 3 (EW, Jan. 11, p 77) at Minneapolis.

King's election climaxes 31 years of service with the company.

Electrical Engineer . . . Born in Minneapolis, Minn., King was graduated as an electrical engineer from the Massachusetts Institute of Technology in 1922. While a student at MIT he began his career with Northern States Power by working summers for the utility in its meter department.

King joined Northern States Power full-time in 1922 as a construction engineer in Fargo, N. D., transferring later that year to the credit department of the headquarters office in Minneapolis. He returned to Fargo as results engineer in the generating plant there. This started 29 years of service in North Dakota, where he served successively as engineer, manager of the company's Minot, Grand Forks, and Fargo divisions, and supervisor of NSP's activities in North Dakota. When NSP created the position of executive vice president in 1951, King was named to the post.

Financial Executive . . . Braheney entered the utility field in 1910 when he joined NSP as a clerk at Stillwater, Minn. He was affiliated with Appalachian Power Co and Louisville Gas & Electric Co before returning to NSP in 1913 at Minneapolis as division auditor. In 1920 he went to Byllesby Engineering & Management Corp, Chicago, advancing to vice president in charge of finance and accounting in 1936.

Braheney returned in 1942 to Northern States Power in Minneapolis as vice president in charge of finance and a year later was elected vice president and treasurer. He assumed the presidency in 1947.

•

R. E. Hodges, manager of Appalachian Electric Power Co's Charleston (W. Va.) Division, has been promoted to assistant general manager of the company at Roanoke, Va. Succeeding Hodges at Charleston as division manager will be **Joe P. Gills,** manager of the Logan (W. Va.) district. New district manager at Logan will be **Miller C. Porterfield,** who has been assistant manager of Welch (W. Va.) district. All these promotions become effective Feb. 1.

Edward C. Logelin has been named a vice president of United States Steel Corp in Chicago to succeed **Arthur C. Wilby,** who has retired. Before becoming vice president in 1946, Wilby for eight years was director of public relations for the corporation in the Chicago district. Logelin replaced Wilby in 1946 as director of public relations.

West Penn Names Riley Power Production Manager

D. H. Riley, assistant manager of power production for West Penn Power Co, has been promoted to manager of power production. In his new job, Riley will be responsible for operation, maintenance, and minor construction at West Penn's generating stations.

Riley, a graduate of Webb Institute of Naval Architecture, Glen Cove, N. Y., started his engineering career with General Engineering & Management Corp of New York, where he was engaged in power station design and construction work. Four years later he joined Jersey Central Power & Light Co, where he remained for 15 years.

D. H. RILEY

He became affiliated in 1943 with Union Carbide & Carbon Chemical Co at the Oak Ridge atomic energy plant, becoming superintendent of power in 1946.

Riley returned to the utility field in July, 1951, when he went to Ebasco Services, Inc, in a consulting capacity on testing and starting new generating units and auxiliary equipment. In May, 1952, he joined West Penn's staff.

ULCO is PIN-POINTED To Your Job!

EXPERIENCED CREWS
expandable as the job requires.

COMPLETE EQUIPMENT
carefully operated, well maintained.

INSURED SAFETY
proper working standards assured—and insured!

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drawn to your individual requirements.

UTILITIES LINE CONSTRUCTION offers a complete "package" that will result in savings to you in '54 . . . a service which includes everything pertaining to line construction and maintenance—from supplying skilled crews, modern equipment and "Know-How" to the finest details involving safety standards and public good-will.

Here is the easiest possible way for you to handle this specialized phase of your utility. We meet with you, the contract is drawn to *your* specifications—then the entire job is done by us. No details to worry you . . . no need to add to your own personnel to cover peaks in construction requirement.

Today ULCO is handling this important job for utilities throughout the United States. Nationwide in scope, we are in a position to quickly discuss with you your plans, outline the Service to you in detail, and *complete the job!*

We invite you to inquire today for full details.

UTILITIES LINE CONSTRUCTION COMPANY, INC.

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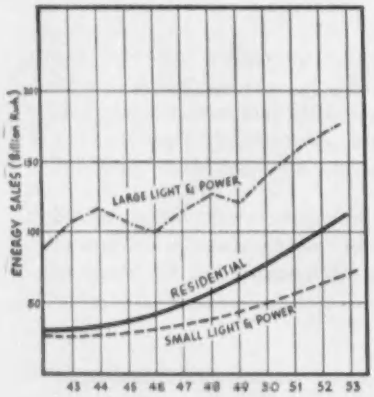
Where Does Electric House Heating

Better Evaluation Now Possible with Facts Added by 1953 Experience. Further Study Indicated.

Need for Study . . . Before any new or unusual load can be evaluated, many questions must be answered. In the case of electric house heating, the first questions were—is it practical—is it a logical step in the "all-electric home" program? How will the total load look when the new load has been added—what additional facilities will be required? Will it yield an adequate return on equipment and operating costs at present rates, or must rates be changed? These and many other questions could not be answered without actual cases to study.

Results to Date . . . To meet this need, thousands of test installations of Glassheat have been made in many states, under various conditions and in several types of buildings, with suitable instrumentation for gathering data. Results, as reported in Electrical World and other publications have cleared away most of the confusion. And, although further study will be needed for rate making, these reports show that enough information is now available for preliminary judgment and that in the main, the outlook is favorable toward electric house heating as a profitable source of revenue.

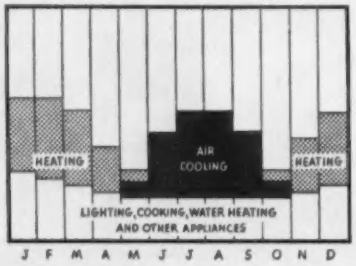
Revenue is Stable . . . Revenue from residential customers is more stable, less affected by ups and downs of business conditions than revenue from any other customer class.



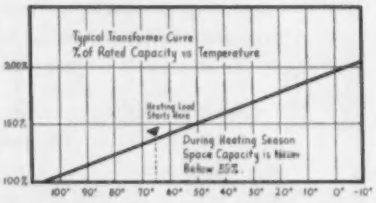
House heating will exert a stabilizing influence on total revenue.

Protects Competitive Position . . . The truly "all-electric home" must include electric heating. Promotion of the all-electric home increases revenue from cooking and water heating loads, and protects against addition of fuel fired appliances such as clothes dryers and garbage incinerators.

Helps Balance Annual Load Curve . . . Phenomenal growth of residential air cooling, added to the air conditioning load for stores, theatres, offices and hotels is changing the annual load curve.



This growing summer load comes at a time when transformer and cable capacities are limited by high ambient temperatures and steam generating stations are least efficient because of higher temperatures of condensing water.


Typical Transformer Curve
% of Rated Capacity vs Temperature
200%
150%
100%
Heating Load Starts Here
During Heating Season Space Capacity is Never Below 25%.
100° 90° 80° 70° 60° 50° 40° 30° 20° 10° 0° -10°

Electric heating, on the other hand, coincides with the highest capability of the system, which is another way of saying that during the heating season, additional load may be taken on without corresponding investment in equipment.

In fact, Atlantic City Electric found transformer capacity around 25% of connected load was adequate because transformers are capable of handling loads considerably above rating during cold weather.

Characteristics Better Than Expected . . . Prior to tests, the house heating load, considered alone, was predicted to have practically no diversity and very poor load factor. Load studies, however, have shown the contrary to be true. The theoretical load is considerably above the actual load and combined with the other household load, the diversity factor is high, particularly where unit heating panels are controlled by a thermostat for each room.

It was also discovered that although the residential peak demand including heating comes between 7 and 8 a.m., the highest demand of the heating units comes about 2 hours earlier.

Peak Demand Can Be Reduced . . . In determining the desirability of any load, the annual load factor, calculated on demand at time of system peak, is of prime importance. Tests by three well known utilities show that the house heating load can be reduced by 75% or more for an hour or two without discomfort to users. This characteristic resulting from the heat storage capability of the well insulated structure, necessary for satisfactory electric heating, means the heating demand may be moved off the system peak. This, in effect multiplies the annual heating load factor by four.

Again, in the Atlantic City tests, the demand factor for heating alone, occurring off peak, was 66.7%, while during the critical 5 to 6 p.m. period it was only 28.8%.

Timing . . . Until there is greater appreciation and understanding of the advantages of electric house heating, the added load will almost certainly come largely from *new* residential construction. At present, only a small percentage of housing starts are planned for electric heating. The most serious retarding influence is the belief that operating costs are much higher than with other house heating methods. The utility therefore is in a position to increase the percentage of starts by establishing encouraging rates. It cannot become an uncontrollable load in an already developed area.

Public Relations . . . Poll of customers using electric heating shows that utilities need not hesitate to recommend it. The overwhelming majority are satisfied with performance and would recommend this type of heating to others. In respect to cost of operation, the opinion of some customers was not so favorable. In many of these cases, dissatisfaction was easily traced to insufficient heat insulation!

Glassheat TRADE MARK BY CONTINENTAL
THE MOST ECONOMICAL HEAT BY ELECTRICITY
CONTINENTAL RADIANT GLASS HEATING CORP.
1 East 35th Street New York 16, N. Y.

Stand?

Sales Aspects . . . The management of one mid-west utility, summing up the situation for its Sales Department, has issued a memorandum to help them answer the questions that most frequently arise. In substance it reads as follows:

Costs: Principal misunderstanding of costs comes from comparing the cost of the fuel oil required for a heating season with the cost of the electricity. Other factors must be included: the initial installation cost, and fixed charges such as interest and depreciation; maintenance cost-repairs and overhaul.

We cannot predict the cost of heating because many factors influence such as construction, thickness and kind of insulation, exposure, wind velocities, living habits, etc.

If customers consult a distributor of Continental Glassheat radiant panels who will calculate the electrical capacity required, we will figure the cost on applicable rate.

Advantages . . . We need have no hesitation in pointing out that electric heat

Is Clean
- No dirt or gases
- No dust circulation
- Fewer cleaning bills
- Reduced painting expenses
- Reduced decorating cost

Is Healthy
- More uniform warmth
- Warm floors
- Natural humidity
- Less drafts
- Safe

Is Easy to Operate
- Immediate heat
- Less heat lag
- Individual room regulation
- Simple automatic control

Gives More Living Space
- No fuel storage
- No boilers or pumps
- No ducts or pipes
- No radiators or valves
- Plus space
- Cellar not necessary

Has Fewer Problems
- No fuel worries
- No tank or pipe repairs
- No pump repairs
- No boiler repairs
- No valve replacement
- No noise
- No maintenance

Glassheat . . . We, as manufacturers of the leading product for electric house heating, have a great stake in the field. We believe that the best interests of all concerned can only be served by close cooperation with utilities, and want to thank the many utilities who have cooperated with us. We have a wealth of data gathered from hundreds of installations which we will be glad to share with any utility management.

If you have not received a copy of our booklet "Electric House Heating" we will be glad to send you a copy.

NRECA'S NEW PRESIDENT J. E. Smith, manager, Mecklenburg Electric Cooperative, is congratulated by group's VP John George. Re-elected Secretary-Treasurer T. E. Craddock is at left

NRECA Elects Smith President

Co-op association also names John George vice president. Craddock is re-elected secretary-treasurer

J. E. Smith, manager of the Mecklenburg Electric Cooperative of Chase City, Va., has been elected president of the National Rural Electric Cooperative Association to succeed Clyde H. Seybold, president of Parke County Rural Electric Membership Corp, Rockville, Ind.

Other Officers . . . The association also elected John M. George vice president and re-elected T. E. Craddock secretary-treasurer for the third year. George, a director of Clearwater Valley Light & Power Association, Lewiston, Idaho, succeeds W. Gordon Loveless, president of the Washington Electric Cooperative, East Montpelier, Vt.

Smith has managed the 12,500-member Mecklenburg co-op since 1938. He had previously spent three years with the U. S. Soil Conservation Service after graduating from Virginia Polytechnic Institute with a B.S. degree in agricultural engineering.

NRECA's new president is a past state vice commander of the American Legion and a member of the Chase City Chamber of Commerce.

Grain Farmer . . . George has been a director of the Clearwater co-op since its organization in 1947. A graduate of Lewiston Business College, George is a grain farmer and cattleman. He is a member of the Grange, Northwest Public Power Association and the Advisory Council to the Bonneville Power administrator.

Since formation of the B. K. Electric Cooperative at Seymour, Tex., in 1939, Craddock has served the co-op as manager. A member of NRECA's board of directors since 1946, he was the NRECA's president in 1947, 1948.

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H. K. Breckenridge, vice president in charge of general departments for West Penn Power Co, has been named by Ebasco Services, Inc, as general manager of the Greek electrification program being handled by the New York consulting firm. Breckenridge, who will make his headquarters at Athens, Greece, became affiliated with West Penn in 1925, becoming vice president in 1947. In other Ebasco appointments, **W. H. McInnis** was appointed manager and **M. G. Kennedy** assistant manager of the company's sales, marketing, and public relations department. McInnis formerly served as assistant manager of that department. Kennedy joined Ebasco in 1950 as a sales and public relations consultant.

Preformed ARMOR RODS

Applied with a *TWIST of the wrist!*

Save Time, Labor

● **Preformed Armor Rods** are quickly and easily applied *by hand*. Their preformed spiral pitch tightly grips the conductor for a perfect, lasting fit. No special tools, clamps or clips are needed. By reinforcing the conductor at the supports, **Preformed Armor Rods** minimize breaks due to vibration fatigue. They also protect against flashovers and arcing, provide increased holding power, prevent abrasion and chafing, eliminate tie and clamp damage, increase radiation area and reduce corona losses. Designed and produced to accurate standards in Aluminum Alloy, Galvanized Steel, Bronze and Copperweld.

Preformed Aluminum Alloy Line-Guards

● Provide protection against wear and abrasion, especially where insulated wires pass through trees. Designed for use with self-supporting service-drop cable . . . also available for covered single conductors. *Ask your Graybar representative for details!*

INDIANA STEEL & WIRE CO.
Muncie, Indiana

C. E. BOULSON

Sho-Me Power Appoints Boulson Acting Manager

C. E. Boulson, chief engineer of the Sho-Me Power Corp, Marshfield, Mo., has been chosen by the Sho-Me board as acting manager to replace S. E. Roberts, general manager, who resigned to take over management of Ozark Electric Cooperative, Mt. Vernon, Mo.

Boulson, an electrical engineer, has served as chief engineer of Sho-Me since its inception ten years ago and was on engineering staff of Missouri Electric Co, Sho-Me predecessor.

Roberts was affiliated with Sho-Me for ten years, serving first as treasurer and later as general manager.

OBITUARY

Col Charles G. Blakeslee, director and former general counsel of the Long Island Lighting Co, died in New York Jan. 8. An expert in the field of public utility law, Col Blakeslee became associated with the Long Island utility in 1936, becoming general counsel two years later. He was appointed a member of the first statewide New York Public Service Commission in 1921, becoming chief counsel in 1923. He resigned from PSC in 1936. Long active in the National Guard, he saw active service on the Mexican Border in 1916 and during World War I.

Kemp Haythorne, 55, manager of new products sales for the electrical wire and cable department of United States Rubber Co, died Dec. 27.

You a target?

Let's face it . . . we're all targets!

If your plant is not ready with a disaster plan, better act now. There's not a single American plant that's out of range of an intercontinental bomber—and fires, floods, tornadoes or explosions can kill you just as dead as an atom bomb.

It costs next to nothing to take a few simple steps which may save hundreds of lives. Here they are. Check them off today.

☐ **Call your local** Civil Defense Director. He'll help you set up a plan for your offices and plant—a plan that's safer, because it's integrated with community Civil Defense action.

☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here, again, your CD Director can help. He'll advise you on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First-Aid Training Courses. They may save your life.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good community relations—and no greater way of helping America.

Act now . . . check off these four simple points . . . lives are at stake . . . have you a right to delay?

No Room for Industrial Complacency

Do you believe that American industry is equipped with remarkably up-to-date and efficient machinery? If you do, you are mistaken. The fact is that a large share of American industry's equipment is ancient, of obsolete design and incapable of attaining the efficiency that is made possible by modern production techniques.

This fact is documented by the Seventh Inventory of Metalworking Equipment, just completed by AMERICAN MACHINIST, a McGraw-Hill publication. In brief, AMERICAN MACHINIST shows that:

1. More than half (56%) of American industry's most basic production equipment—machine tools and metal-forming units—is overage, and much of it is so old that it has very limited usefulness.

2. Since Korea, the situation has become dangerously worse.

Facts vs. Plausible Theory

These conclusions contradict the widely-held impression that America's industrial equipment is in better physical shape than ever before. The prevalence of this impression is not surprising. We, as a nation, have spent about $125 billion for new industrial plant and equipment since World War II. That is more than in any previous period in our history. During 1953, American industry invested $21 billion in new plant and equipment, an all-time high. From this, it would be reasonable to infer that our industrial plant and equipment must be in fine condition.

But the facts do not support that inference with respect to the machine tools and other metalworking equipment that are so crucial to our economy in war and peace. Here are the key findings of the AMERICAN MACHINIST Inventory:

(1) More than one million machine tools—out of a total of less than two million in the metalworking industries—are at least ten years old. Many of these, after day and night operation

during the war years and the recent rush to rearm, are actually much older production-wise than their age in years indicates. In most cases, these machines are unable to produce goods as efficiently as modern equipment can, thus needlessly increasing costs.

(2) Almost one out of five machine tools is more than twenty years old. Most of these machines are so outdated by modern standards that they have little more than scrap value. And an even larger portion of our metal-forming equipment (presses, brakes and shears, bending and straightening machines) has passed the 20-year mark and is beyond normal retirement age.

(3) Two out of three machine tools are of designs predating World War II, though many of them have been built since the war. Thus, two-thirds of our machine tools fail to incorporate the many major postwar improvements in design and operating methods.

(4) Never before has outmoded high-cost equipment been so widely diffused throughout American industry. In every one of fifteen major divisions of metalworking production, more than 45% of the machine tools are at least ten years old.

(5) Not since the depression days of the 1930's has the average age of machine tools risen so rapidly as it has in the past four years. Today, 55% are ten years old or older, compared with 43% just before Korea.

Quality vs. Quantity

Why has the condition of our metalworking equipment been steadily deteriorating since the end of World War II? Part of the explanation lies in the fact that, in the immediate postwar years, production of metalworking equipment lagged behind the production of industrial equipment generally. The larger part of the explanation, however, lies in the tremendous postwar expansion of the American economy. This expansion, which has more than doubled our total industrial capacity, has imposed requirements for metalworking machinery that have been met only by more extensive use of old and obsolete tools. In the critically important field of metalworking, the job of providing up-to-date tools is bigger than it ever has been.

There are those who argue that the time has come to cut back investment in new industrial plant and equipment and divert more of the national income into current consumption. They cite both the great increase in the nation's total industrial capacity since World War II and the fact that some industries now have more than ample producing capacity to meet their needs. But this type of calculation leaves out the *efficiency* of that producing capacity.

The AMERICAN MACHINIST Inventory makes it manifest that in the key field of metalworking we are alarmingly short of first-rate, low-cost producing capacity. If we fail to remedy this situation by speeding the replacement of obsolete tools, it will be at the peril of our prosperity, at the peril of a sustained increase in our standard of living and of our national security.

McGraw-Hill Publishing Company, Inc.

CONSTRUCTION is nearly complete on General Electric Co's $25-million transformer plant (shown above) at Rome, Ga. First transformer manufactured there was shipped earlier this month to Georgia Power. Large building in the foreground of this aerial photograph is main plant. Another manufacturing building is in center background. Administrative offices will be housed in building at left behind main manufacturing structure. Plant will employ 1,700

GE Ships 1st Transformer . . .

. . . from its $25-million Rome, Ga., plant. Georgia Power Co to use the 5,000-kva unit at an Atlanta substation

First transformer to be manufactured at General Electric Co's nearly completed $25-million plant at Rome, Ga., was rolled off the production line earlier this month and turned over at a brief ceremony to Georgia Power Co officials.

The 35,300-lb transformer, reported to be the first of its size to be manufactured in the South, will be used by the utility to step down voltages at an Atlanta substation. Work on the 5,000 kva, 3-phase unit was started in the third quarter of 1953.

J. M. Oliver, vice president and general manager of Georgia Power, said at the ceremony, "This transformer, which is only the first of the hundreds that will roll out of this plant when production reaches capacity, means that consumption of electricity will continue to increase in this area, bringing an ever better standard of living to Georgia and the South."

Construction of GE's new plant began in 1952 and is expected to be completed in the spring of 1954. Power transformers, rated at 501 to 10,000 kva and weighing from 4 to 30 tons each, will be made in the plant with a new near-conveyor-type system. The plant will employ 1,700 persons.

"This plant is the first we have ever built to mass-produce small power transformers, and marks a new era in our ability to furnish these units more quickly to supply the needs of industry," declared W. S. Ginn, general manager of GE's power transformer department.

Among executives at the ceremony from Georgia Power were President Harlee Branch, Jr, J. J. McDonough, C. M. Wallace, Jr, H. W. Boozer, J. R. Carmichael, J. F. Pennington, and H. M. Oldam. From GE were: C. J. Hendon, commercial vice president, Southeastern district; and Carter Redd, district manager of Apparatus Sales Division.

Westinghouse Foresees 45% Output Rise by '57

Expansion of its normal output capacity by 45% over 1952 is the goal Westinghouse Electric Corp has set for itself by 1957. This output, based on existing and planned facilities, will amount to $2.1 billion in terms of current price levels, Westinghouse's Vice President Mark W. Cresap, Jr, told the security analysts of San Francisco, Jan. 12.

By way of comparison, Cresap estimated that the company's actual volume of sales for 1953 will be $1.6 billion. Capacity sales volume for 1957 hinges on improvements in market position for all of the company's four product groups. Westinghouse expects a 75% increase in its present share of the consumer goods market, with increases of 35% for its general products divisions and 15% for the apparatus products divisions.

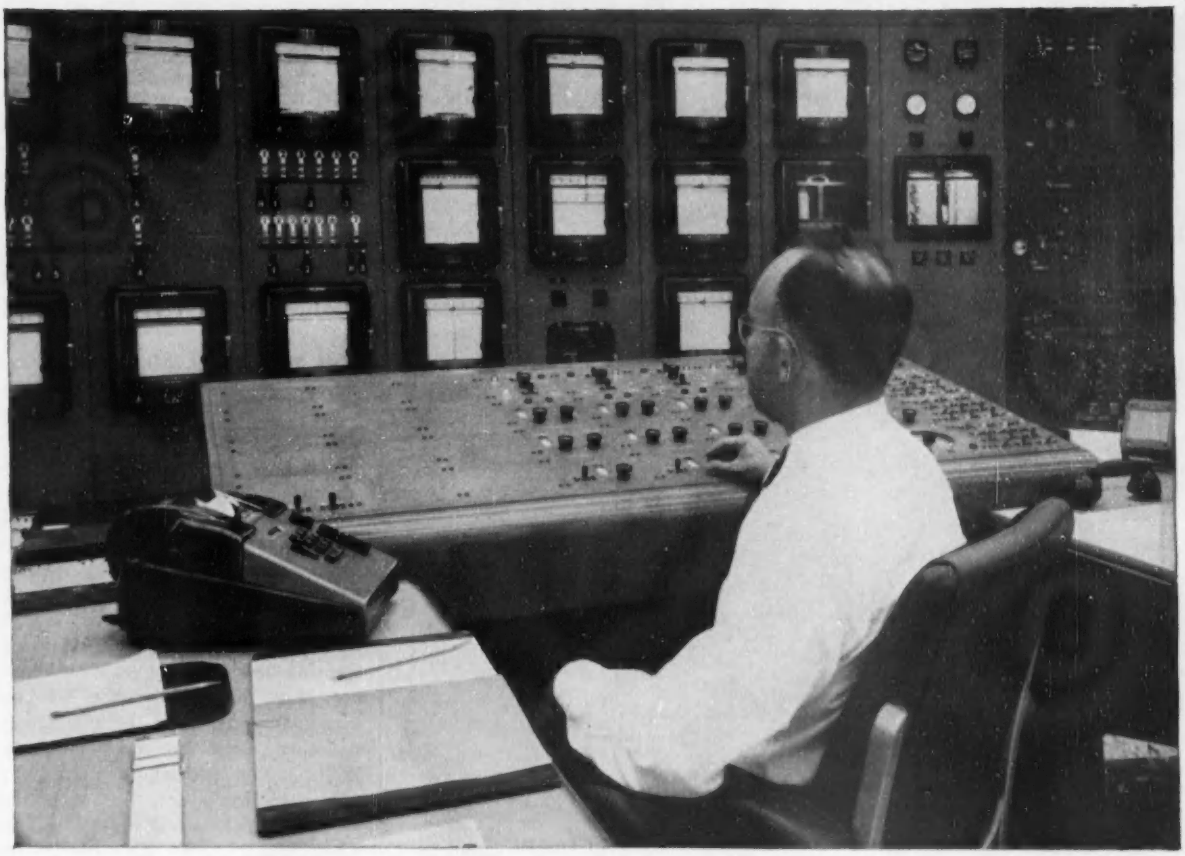
For 1954, Westinghouse is contemplating and budgeting higher sales billings. Expectation of increased aggregate sales over 1953, a record-breaking year, was termed a realistic policy, even if general business conditions are somewhat less favorable. In support of the 1954 outlook, Cresap cited progress on schedule in a $300 million expansion program to boost manufacturing output. Expenditures to date have totaled about $190 million with the remainder to be completed by early 1955.

An order backlog for apparatus products equaling yearly capacity and a considerably greater defense products backlog portend continued increased activity in these two product groups. Operation of the company's consumer products divisions during 1954 is expected to reflect an improved market position resulting mainly from intensified sales efforts.

MANUFACTURERS' EARNINGS

Company	Period Months	Ended	Net Income 1953	Net Income 1952	Earnings Per Common Share 1953	Earnings Per Common Share 1952
Cornell-Dubilier Electric	12	Sept.	$1,666,696	$1,539,831	$3.12	$2.86(a)
Dow Chemical	3	Nov.	7,000,597	9,284,134	.30	.42
Dow Chemical	6	Nov.	16,763,554	17,224,023	.71	.77
Harnischfeger	12	Oct.	3,167,890	3,079,743	4.29	4.17
Kaiser Aluminum & Chemical	3	Nov.	417,393	846,430	.05	.17
Midwest Piping	9	Nov.	1,741,428	1,536,875	2.25	1.99(a)
Monsanto Chemical	12	Dec.(b)	26,384,592	23,189,243	4.90	4.29

Notes—(a) Based on number of shares now outstanding, and (b) Preliminary statement.



He's solving

400,000

Load-Frequency Control Problems

This System Operator is balancing system generation against the demands of 400,000 customers on the Long Island Lighting Company system. Each of these customers is a "problem," because each expects power at the right voltage and frequency when he flips a light switch.

In order to meet these changing demands, the System Operator needs two things: First, a complete picture of system operating conditions, and second, a convenient method of making the appropriate control adjustments.

System data is supplied by the above panel-mounted Speedomax Telemeters with such accuracy that transmitting and receiving chart curves can't be told apart. Two of these Speedomax Telemeters also provide information on the power flow across an interconnecting tie line which links the Long Island system with a neighboring utility.

The L&N control console directly in front of the System Operator houses all dials and setters necessary for effective system regulation. In order to solve his 400,000 problems, therefore, he simply dials the correct settings.

To solve your particular Load-Frequency control problems, write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa. The response you get will be backed by know-how gained in making more than 300 Load-Frequency control installations throughout the country during the past quarter-century.

LEEDS NORTHRUP

instruments *automatic controls • furnaces*

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Where Lighting Keeps Pace With
MODERN SCHOOL PLANNING

New Sylvania IC Fluorescent Fixtures meet highest standards of new Thomas Jefferson Junior High School, Clairton, Penna.

Notice the soft, well-diffused light provided by these Sylvania IC Low-Brightness Fluorescent Fixtures in this modern classroom installation. *Architect:* Joseph Hoover, Hoover Bldg., Pittsburg, Penna. *Electrical Engineer:* Elwood S. Towers, Investment Bldg., Pittsburgh.

In planning this handsome new junior high school, educational authorities, architects, and lighting engineers agreed that the new Sylvania IC Low-Brightness Fluorescent Fixtures met their strict requirements for uniform light distribution, quick easy installation, low maintenance, and attractive appearance. The 40-watt T-17 low-brightness lamps minimize reflected glare, and the excellent 42° crosswise shielding shields the lamps from direct view.

Writes Mr. Joseph Hoover, Architect of this up-to-the-minute school: "In designing school buildings, we endeavor to provide the most efficient classrooms and facilities possible. The Jefferson Junior High is an example of this idea in operation. Essential to these requirements is proper lighting, providing even distribution, correct intensities, easy maintenance, low replacement, and competitive costs. We believe the Sylvania IC Units meet these requirements."

Let us give you full information concerning the many advantages of Sylvania's new line of IC Fluorescent Fixtures. For illustrated folder simply address Sylvania, Dept. 4X-2801, today.

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine St., Montreal, P. Q.

LIGHTING · RADIO · ELECTRONICS · TELEVISION

MANUFACTURING BRIEFS

Hotpoint Co has announced that its 1954 modernization program will more than double its manufacturing capacity for automatic electric washing machines and clothes dryers. Plan calls for enlargement and modernization of the Chicago plant to permit shipment of carload lots of mixed major appliances to dealers.

Line Material Co, Milwaukee, is expanding production facilities of three of its plants. At Illinois Electric Porcelain Co's Macomb, Ill., plant, which L-M manages for the parent organization, McGraw Electric Co, major improvements call for increased production area, new equipment, modernized ceramics laboratory, and a new office to enable IEP to add new product lines. Improvements are to be completed this spring. L-M is increasing floor space at its Kyle Products Plant, South Milwaukee, Wis., to accelerate production of oil circuit reclosers. At its Central Plant, L-M is expanding production space and equipment for a new line of power switches and capacitor housings. These new facilities are slated to be operating by May 1.

National Vulcanized Fibre Co's new building and product development program calls for a half-million dollar building and facilities expansion project at its Phenolic Plant at Kennett Square, Pa. Part of the plan also involves organization of a new development and research department devoted to improvement of company products and development of new materials for manufacturing.

Bridgeport Brass Co has sold a nearly completed 200,000-sq ft brass and copper tubing plant in Bridgeport, Conn., to the Knights of Columbus for $1.8 million in cash. Under the terms of the agreement, Bridgeport Brass will lease the building, scheduled to be completed shortly, from the K. of C. for a period of 20 years at annual rental of about $136,800. The firm has the privilege of renewing the lease at reduced rental for four successive ten-year periods.

Aluminum Ltd, Montreal, Can., has reported that construction of a new fabricating plant for aluminum is well

under way in Alicante, Spain. The new plant is owned by Aluminio Iberico, S. A., a company formed about two years ago and controlled jointly by Aluminum, Ltd, Manufacturas Metalicas Madrilenas, S. A., of Madrid, and a group of Spanish banks and individuals. Plant's capacity will be 18,000 to 20,000 tons a year of aluminum sheet, plate and extrusions, aluminum steel-reinforced cables for power transmission and aluminum foil for the wrapping of Spanish fruits.

SALES ASSIGNMENTS

COMPANY STAFFS

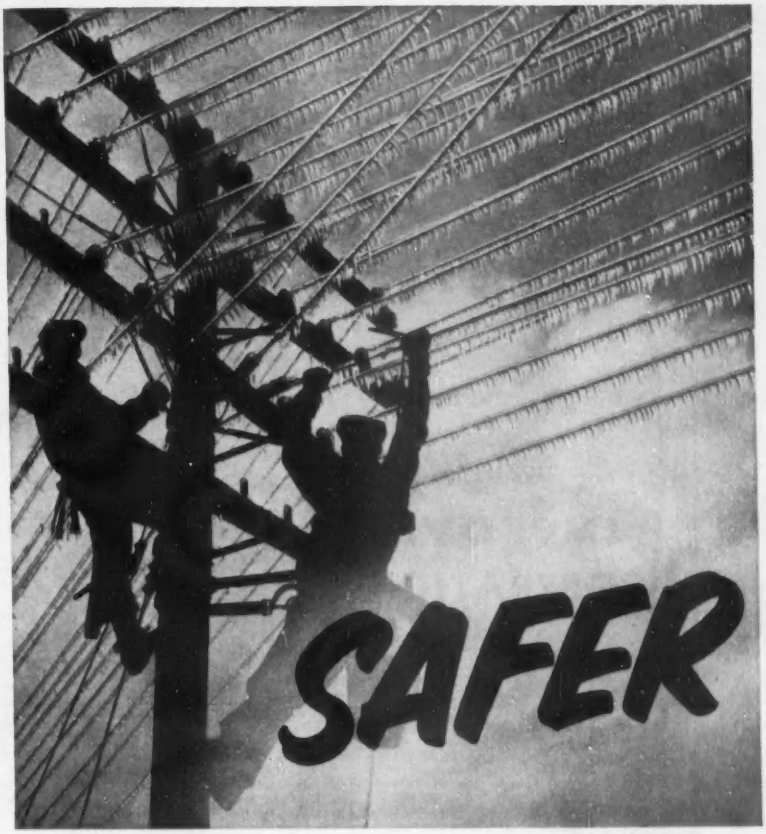
American Steel and Wire Division of United States Steel Corp has appointed Edward A. Murray as Detroit district manager of sales. Murray has returned to the division after serving for two years as vice president of sales for Appleton Electric Co, Chicago. He succeeds Maxwell D. Millard, recently appointed assistant general manager of sales for the division.

Reliance Electric & Engineering Co, Cleveland, has made William C. Mitchell manager of its branch sales office at Toledo to replace John Drollinger, Jr, who was named manager of the company's Renewal Parts and Repair Division at Cleveland.

Line Material Co, Milwaukee, Wis., has appointed three new field engineers in its North Central Division. John R. Botts has been assigned the southern Minnesota area handled by Tom D. Williams, who now covers central Minnesota and eastern Wisconsin. Botts and Williams will make their headquarters at Minneapolis. Wilbur R. Coffin handles the western Minnesota and eastern North Dakota territory out of the Fergus Falls, Minn., office. He replaces Gordon J. Griffith, recently transferred to L-M's Milwaukee office. Gerald O. Smith will cover western North and South Dakota, eastern Montana, and northeastern Wyoming from L-M's newly established office at Bismarck, N. D.

General Electric Co's Commercial Equipment Department has named the following regional managers to handle mobile two-way radio and microwave communication equipment: I. M. Ellis was appointed regional manager for the West Coast with headquarters at San Francisco. He succeeds L. R. Sheeley, who was recently transferred to Syracuse, N. Y., as manager of sales. G. F. Reed was made regional manager at Detroit to replace R. L. Casselberry, recently assigned to Syracuse as manager of product planning and marketing research. G. P. Foster was named regional manager for the Midwest with headquarters at Chicago. He replaces H. N. McNeill, recently transferred to Syracuse as manager of product service.

National Electric Products Corp, Pittsburgh, has appointed Theodore M. Linton as district sales manager of its New England district. Linton, formerly district manager in the company's Washington, D. C., office, will supervise marketing of National Electric's electrical wires, cables, conduits, and raceways from Connecticut to Maine out of the Cambridge, Mass., office.



A veteran lineman was asked: "What precautions do you take before climbing a pole to make sure that it is safe?" His reply: "First we make sure it's a Koppers Pole, then we don't worry."

on dependable Koppers Poles

• It's a nasty job, at best, to work on lines that are crusted with ice. And linemen don't want the additional danger of working on spongy poles that have been weakened by shell rot.

When the poles are Koppers, linemen are safer. They *feel* safer, too, because they know their gaffs will get a good, solid bite on sound wood.

Koppers Poles, for their full length, are pressure-creosoted against decay, weathering and termite attack. They *stay* sound and strong through the years.

Many strategically located Koppers treating plants assure prompt, dependable service.

For dependable poles, backed by a dependable company, specify Koppers. Write to us for prices or further information.

KOPPERS COMPANY, INC.
Wood Preserving Division • Pittsburgh 19, Pennsylvania

KOPPERS PRESSURE-CREOSOTED WOOD

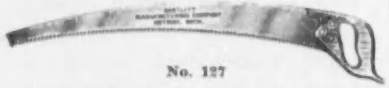
and

IMPROVES OPERATION

• Care and skill in tree trimming operation are extremely important. They can build good will rather than injure it—and certainly improve operation. Clear lines for 1954 may be insured with the least trouble if trimming is done in the near future. As a supplement to your own crews, there are a number of firms that make a business of tree trimming for power companies; many of them use Bartlett Tree Trimming Equipment and consider these tools efficient and, above all else, SAFE. If your crews are not equipped with Bartlett Tools, write for particulars.

BARTLETT COMPOUND LEVER INSULATED TREE TRIMMER

Bakelite Insulator-tested to 105,000 volts. Compound Lever Head, cuts 1¾ in. branches easily. High grade materials—a first class, lasting tool, made with one piece pole or with sectional pole as you wish, 6 to 16 feet. Laminated sitka spruce.



No. 127

18", 22", 24" or 26" blade, draw cut, large hand hole horn or "D" type handle

Also Pole Saws, Hand Pruning Saws, Two Hand Pruners, Tree Paint, Lag Thread Tree Rod, etc.

Ask for Public Utility Catalog.

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MEETINGS CALENDAR

***Edison Electric Institute**
Joint Meeting of EEI Meter-Service Committee and Association of Edison Illuminating Companies Metering and Service Methods Committee, Adolphus Hotel, Dallas, Tex., Feb. 3-5; Commercial Lighting Committee, Washington, D. C., Feb. 4-5; Transmission and Distribution Committee, Hotel Cleveland, Cleveland, Ohio, Feb. 9-10; Electrical Equipment Committee, Sheraton Cadillac Hotel, Detroit, Mich., Feb. 15-16; Commercial Space Heating and Air Conditioning Committee, Tutwiler Hotel, Birmingham, Ala., Feb. 18-19; Industrial Relations Committee, EEI Headquarters, New York, March 18; 20th Annual Sales Conference, Edgewater Beach Hotel, Chicago, April 5-8; EEI-AGA Accounting Conference, Hotel Statler, Boston, April 12-14; Industrial Relations Committee, Netherlands Plaza Hotel, Cincinnati, Ohio, April 15; Annual Convention, Atlantic City, N. J., June 1-4.

***Pennsylvania Electric Association**
Communications Committee, Henry Hudson Hotel, New York, Feb. 4-5; Hydraulic Power Committee, Fort Stanwix Hotel, Johnstown, Pa., Feb. 4-5; System Planning Committee, Hotel Sheraton, Pittsburgh, Pa., Feb. 8-9; Transmission-Distribution Committee, Lord Baltimore Hotel, Baltimore, Feb. 11-12; Prime Movers Committee, Hotel Robert Treat, Newark, N. J., Feb. 15-16; Systems Operation Committee, Fort Stanwix Hotel, Johnstown, Pa., Feb. 18-19; Electrical Equipment Committee, Hotel Roosevelt, Pittsburgh, Feb. 25-26; Relay Committee, Benjamin Franklin Hotel, Philadelphia, March 4-5.

***Public Information Program**
West North Central Region Meeting, Edgewater Hotel, Madison, Wis., Feb. 5; Inter-Regional Committee, Blackstone Hotel, Chicago, Feb. 17; East North Central Region, Cleveland, Ohio, Feb. 25.

Electrical Equipment Representatives Association
Winter 1954 Meeting, Biltmore Hotel, Los Angeles, Feb. 8-11.

Public Utilities Advertising Association
Region 5 Meeting, Atlanta, Ga., Feb. 11-12; Region 1 Meeting, Mount Royal Hotel, Montreal, Que., Feb. 25-26; National Convention, Hotel Statler, Boston, May 13-14.

National Association of Purchasing Agents
Mid-Winter Conference, Public Utility Buyers' Group, Lord Baltimore Hotel, Baltimore, Md., Feb. 15-16.

National Electrical Manufacturers Association
Spring Meeting, Edgewater Beach Hotel, Chicago, March 8-11.

Southeastern Electric Exchange
21st Annual Meeting, Boca Raton Hotel, Boca Raton, Fla., March 22-24; Spring Meeting, Engineering and Operation Section, Sans Souci Hotel, Miami Beach, Fla., May 6-7.

American Power Conference
Sherman Hotel, Chicago, March 24-26.

Oklahoma Utilities Association
Annual Convention, Biltmore Hotel, Oklahoma City, March 25-26.

Northwest Public Power Association
Annual Convention, Winthrop Hotel, Tacoma, Wash., March 31-April 1-2.

American Institute of Electrical Engineers
Conference on Feedback Control, Claridge Hotel, Atlantic City, N. J., April 22-23; Northeastern District Meeting, Schenectady, N. Y., May 5-7; Conference on Telemetering, Morrison Hotel, Chicago, May 24-26; Summer General and Pacific General Meeting, Hotel Biltmore, Los Angeles, June 21-25.

American Society of Mechanical Engineers
Semi-Annual Meeting, William Penn Hotel, Pittsburgh, June 20-24.

Michigan Electrical Association
Annual Convention, Grand Hotel, Mackinac Island, Mich., June 27-30.

*Addition this week.

DUXSEAL®
plugs 'em fast-to last!

DUXSEAL is a nonhardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package, for smooth, workmanlike jobs.

Duxseal stays plastic—will not slump, melt or run under ordinary temperatures. Clings to duct walls and cables but flexes with expansion and contraction. It is unaffected by water and gases, does not react with rubber, metals or painted surfaces. For full information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

JM

Johns-Manville
SEALING COMPOUNDS

Britain's Kwhr Bills

(*Continued from page* 146)

31.0% in 1952. In the comparable period the residential customer's participation in total utility sales in the U. S. increased from 19.5% to 22.7%.

While the industrial customers had also major rate increases, as was previously noted, such increases were presumably shifted in the sale of manufactured goods to the ultimate consumer and to the extent that these consumers were also residential customers, their total burden was increased that much more.

It is of interest to note at this juncture that, in spite of strenuous efforts to increase the electrification of Britain's heavy industry, the largest relative increase in kilowatthour use is to be seen in the commercial classification. Thus, while the increase for industrial kilowatthour sales since the utility industry was socialized in 1948, amounted to 37%, commercial sales increased 67% while residential sales increased only 24%. In addition, the increase in price per kilowatthour was least for commercial customers amounting to 3.2% compared with 10.3% for residential and 14.8% for industrial.

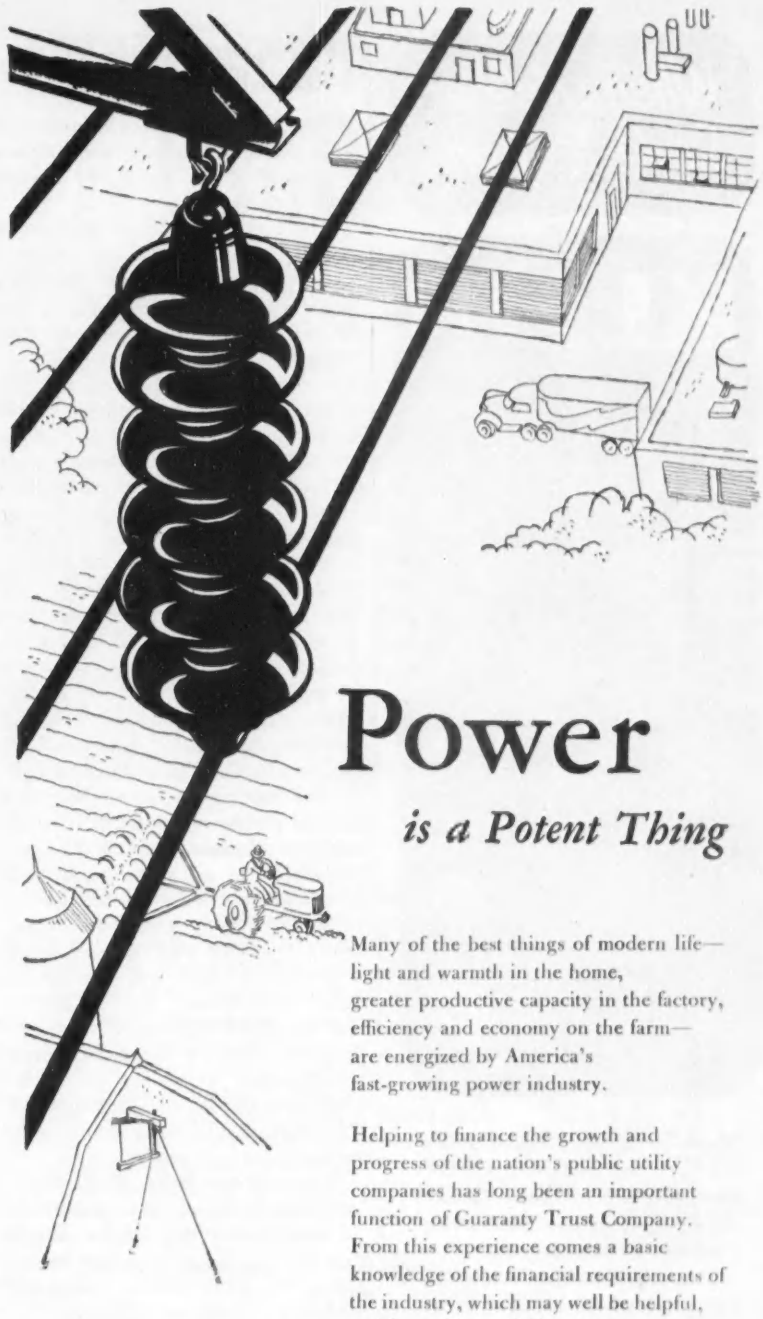
The overall use of electric power per ultimate customer has lagged substantially behind the U.S. as is shown below:

	Britain	*United States*
1950-1951	3,590	6,680
1951-1952	3,750	7,180
1952-1953	3,760	7,420
Increase 52/53 over 50/51	4.9	11.1

Not only was the U. S. kilowatthour consumption nearly double that of Britain but the rate of growth over the last three years was substantially in excess. The same situation is, of course, reflected in the usage per head of population which amounted to 1,105 kwhr in Britain and to 2,200 kwhr in the U. S.

Awarded Rate Hike

Commonwealth Edison Co has received Illinois Commerce Commission approval to increase electric and gas rates by $20,480,000 annually. This will become effective February 1. Boost will average 6½% for the 1,730,000 customers of the company.



Power
is a Potent Thing

Many of the best things of modern life—light and warmth in the home, greater productive capacity in the factory, efficiency and economy on the farm—are energized by America's fast-growing power industry.

Helping to finance the growth and progress of the nation's public utility companies has long been an important function of Guaranty Trust Company. From this experience comes a basic knowledge of the financial requirements of the industry, which may well be helpful, and is readily available, to you.

Guaranty Trust Company of New York *Capital Funds $390,000,000*

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When Life's at Stake Rely on...

KLEIN

Show the familiar Klein trademark to the old-timer on the pole and he'll tell you—"that's the equipment I've been using ever since I was a grunt."

Yes, workmen just naturally feel safer when the equipment is Klein—recognized for quality "Since 1857."

ASK YOUR SUPPLIER
Foreign Distributor: International Standard Electric Corp., New York.

Write for your free copy of the Klein Pocket Tool Guide today!

Since 1857

Mathias KLEIN & Sons
Established 1857 — Chicago, U.S.A.
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State Corp Grants Vepco $4.8-Million Rate Hike

The State Corporation Commission of Virginia has granted the Virginia Electric & Power Co a $4.8 million annual rate increase.

The commission in its brief stated that it:

". . . is of the opinion and finds that the rates and charges proposed in the new schedules of rates and charges filed by the applicant on Oct. 6, 1953, are reasonable and just under the evidence submitted in this proceeding, but that further study thereof as hereinafter directed should be made, and that said new schedules should be approved for use by the applicant in this state on all meter readings taken on and after Mar. 1, 1954, and the commission further finds that the rates and charges set forth in said new schedules will produce a rate of return of less than 6% on any of the rate bases considered by the commission in its investigation and determination of the application of the applicant in this proceeding.

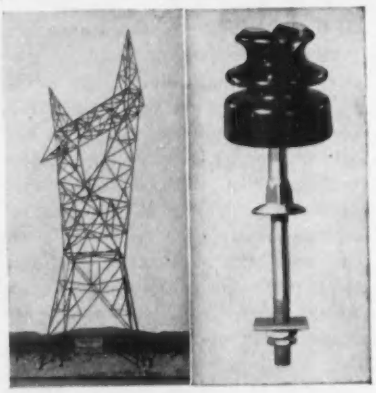
"The commission further finds that a study should be made under the direction and supervision of the commission of the cost of service of each of the classes of types of service rendered by the applicant under any and all of its filed and approved schedules of rates and charges in order to determine whether any of said schedules under which applicant renders service are unjust and unreasonable and it directs the staff of the commission under the supervision of the commission to make arrangements forthwith for such study."

Commissioner Ralph T. Catterall, in a concurring opinion, stated that he "concurs in this opinion except that he is of the opinion that the increase in rates herein authorized should be limited to $3,853,000 of additional annual gross revenue systemwide."

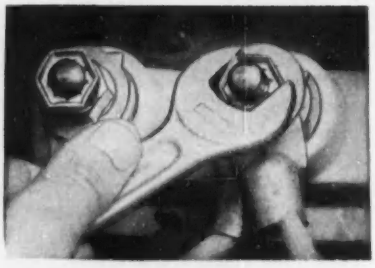
SEC Gets Sale Request

Cities Service Co has asked the Securities and Exchange Commission approval to sell its investment of 1.5 million shares in the Gas Service Co for $32 million to the Missouri Public Service Co. SEC was told that this offer was "substantially in excess" of any received.

Assemblies stay tight!



Connections stay tight!



—when locked with
PALNUT LOCK NUTS

FOR years, PALNUTS have been the standard lock nuts of the utility industry—on steel towers, wood pole hardware, connectors, disconnects, switches, fittings, transformers, etc. Here's why: PALNUT Lock Nuts stay tight under severest vibration, are very low in cost, apply fast and easily, require little space. Available in full range of sizes, in plain, Parkerized and Hot Dip Galvanized steel; also silicon bronze.

Samples and literature on request.

THE PALNUT COMPANY
51 Cordier Street,
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PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost

NRECA Meeting

(*Continued from page* 137)

who advocates a federal monopoly in the power business. At no time have I ever done or said anything that I believe would give the impression that I advocate it."

Said Aandahl: "I think it is most fortunate that this particular question is made a part of public discussion at this occasion and that this group be given the opportunity that they have now been given to so firmly assert that that is the position. Whenever any group of customers want to place upon the federal government a responsibility to supply their full power needs as was indicated in the quote that I made in my remarks, it is working in the direction of a federal power monopoly."

Countered Ellis: "I don't believe that when the government develops power wholesale and sells it wholesale that that can be alleged to be government in the power business as a monopoly. For instance [in the Tennessee Valley] the government simply produces the power wholesale and with the exception of selling some large industrial loads the government is not in the power business. It only develops it wholesale and sells it to rural electric cooperatives. If you say the government has a power monopoly in the Tennessee Valley then you weed us out of the picture."

Replied Aandahl: "A monopoly of the wholesale production of power is just the first step in total federal monopoly. You give the federal government first a monopoly on the wholesale power, it isn't too difficult a step to get monopoly of the retail system, too."

Commented Ellis: "We don't want to see a private monopoly, either."

Only the Beginning . . . The case didn't rest there. The following morning [Wednesday], Julius Helm, executive manager of Missouri State Rural Electrification Association, ignored his text prepared for another panel discussion to charge that the Interior Department was using Ellis as a scapegoat to attack the rural electric program. Terming the Aandahl speech "the worst thing that has ever happened," he called upon the panel recorder to suggest that the convention as a whole give Ellis a vote of confidence.

Before day was done a special reso-

rotary multipole switch
ESCO TYPE-A

The ESCO Type-A Rotary Switch is a compact, multipole switch for tap, transfer, and selector service.

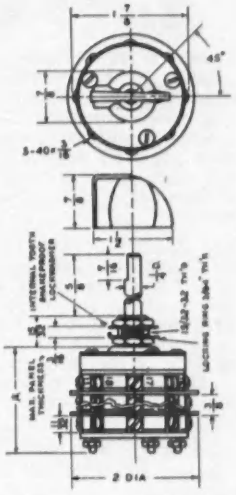
It can be furnished for continuous rotation, in both directions, through eight positions, or can be provided with movement limited to from two to eight positions. An important advantage of the Type-A switch is that it has an exceptionally sturdy detent mechanism that assures positive positioning of the switching elements at all eight positions.

Movable contacts carried on molded-phenolic rotors engage fixed contacts distributed around the circumference of recessed, molded-phenolic disks so constructed that the make and break action is wholly contained within an insulating enclosure. Assemblages of fixed and movable contacts to suit varied switching needs can be combined so that as many as seven different sections can be controlled by a single knob.

ELECTRICAL RATINGS — TYPE-A SWITCH

Service		Amperes	Volts
Continuous current		10 a-c/d-c	125
Interrupting	0.75 p. f.	5 a-c	125
	lamp load	3 a-c	125
	non-inductive	5 d-c	30
		1 d-c	125

Heavy-duty rotary switches rated at 10, 30, 60, 100, or 200 amperes are also available from ESCO. Bulletins giving detailed specifications on all ESCO switches will be furnished on request.



SECTIONS	DIM. A	APPROX. WEIGHTS
1	1 1/16	3 oz.
2	1 7/16	4 oz.
3	1 13/16	5 oz.
4	2 3/16	6 oz.
5	2 9/16	7 oz.
6	2 15/16	8 oz.
7	3 5/16	9 oz.

ELECTRO SWITCH
CORPORATION
167 King Avenue, Weymouth 88, Mass.

Every Movement has a SAVINGS of its own . . . . .

SAVE UP TO 75% of MATERIALS HANDLING COSTS WITH

HEAVY-DUTY FORK

LIFTRUK

OR

LIFT-O-KRANE

Leading Public Utilities find these heavy-duty, rugged SILENT HOIST machines dependable and efficient for the continuous, complex requirements of the transportation department, storage area, repair shop . . . in the movement of Generators and other heavy equipment, Cable, Wire, Maintenance Supplies, Poles and general equipment.

The LIFTRUK *Fork Lift Truck* and LIFT-O-KRANE *Combination Crane and Fork Lift Truck* handle capacity loads with maximum stability and safety. They have high lifting range. Make short turns in narrow spaces. Promote maximum efficiency for storage areas . . . and effect rapid inloading and outloading, with economic use of manpower.

Send for Bulletin 77 for LIFTRUK. Bulletin 75 for LIFT-O-KRANE

Makers of KRANE KAR Mobile Boom Crane, KARRI-GO Front Boom Crane, SILENT HOIST Cranes for Motor Truck Mounting, SILENT HOIST Winches and Capstans, SILENT HOIST Hydraulic Telescopic Truck Towers, etc.

SILENT HOIST & CRANE CO.

Pioneer Manufacturers of Heavy-Duty Equipment for Public Utilities and Municipalities

lution had been drawn up and passed unanimously. It stated that NRECA's members "resent and will vigorously oppose Mr. Aandahl or any other person or persons who attempt by such charges to regulate our thinking, to divide our interests, and to destroy our unity."

The resolution also approved "the past actions our national board of directors, our officers, and our executive manager, Clyde T. Ellis."

Official Approval . . . This action by the entire assemblage received an official stamp of approval on the final day, when the voting delegates unanimously passed a second resolution. It stated "we do categorically deny and repudiate the implication made that the NRECA, its members or its executive manager, have been 'crusaders for federal power monopoly.'"

The resolution went on to state "to Assistant Secretary Aandahl and any others . . . that it is the intent and the compelling purpose of this association and its members and personnel to cooperate fully with the Department of the Interior."

When asked later if he considered Aandahl's remarks to be a personal attack on him, Ellis stated that he hadn't had time to examine all the implications of the statement. "However," he said, "it is obvious that our people consider his attack a little ungentlemanly."

Ellis stated that he "strenuously objected" to Aandahl's kind of deduction. "To pull a quote out of context from a speech made to pertain to a particular region of the country and to generalize from that inadequate testimony is sheer demagoguery," he said.

In reply to a question as to the ultimate purpose of Aandahl's remarks, Ellis commented:

"I think any attempt by government to tell our people how they should think is a form of fascism."

Program Outlined . . . The day before Aandahl let loose his bombshell, Ellis had made his annual report to the membership. He asserted that "a principal key of our management problem today is to assure continuation, full speed ahead, of the power supply phase of the federal-local partnership."

"Any break-up of this partnership," he said, "could easily result in a rise of at least a third of a cent in the

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present average cost of power to the farmers' electric systems countrywide."

Most serious threat to this partnership posed during 1953, Ellis said, was "a restatement of federal power policy, first by the House Appropriations Committee and then by the Department of the Interior."

He pictured the moves as "a partial shift of federal partnership from local community power systems to the privately owned systems whose loyalty is to Eastern financial controls."

Government View . . . REA Administrator Ancher Nelsen, speaking at his first national NRECA meeting, outlined these "paramount needs" of the rural electrification program:

- Keeping local cooperatives self-reliant and financially strong.
- Continuing REA's authority to make generation and transmission loans, "to safeguard the bargaining power of REA's borrowers."
- Maintaining the lending program at a level adequate to take care of extension to service to the unserved, system improvements to handle expanding power use, and generation and transmission facilities.

He emphasized that "there is not, as has been alleged in some quarters, any understanding, secret or otherwise, to limit the program or slow down the lending rate."

He also repeated his call for cooperation among farmers, REA, the Interior Department, municipalities and commercial utilities, "to realize healthy, normal and economically sound growth."

"Great benefits could be accomplished," he said, "by power supply committees set up in each state or area working toward sound and proper objectives through an industry-wide approach."

Nelsen Defended . . . Among other speakers at general sessions during the four-day conclave were Senators Wayne Morse (Ind., Ore.), and Burnet Maybank (D., S.C.), Ellis Arnall, former governor of Georgia, and Representatives Chet Holifield (D., Calif.) and Harold O. Lovre (R., S. D.).

Lovre defended the new REA Administrator, and the Administration's handling of REA and Interior Department policies.

"For the first time in the 18-year history of rural electrification," he

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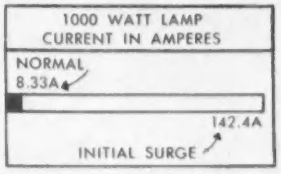

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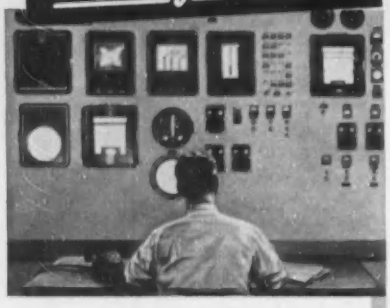

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said, "determined efforts have been under way to make a political football out of REA. Individuals and groups without authority to speak for either of the major political parties have tried to make it appear that the present administration was talking with tongue in cheek when it drafted a party platform that pledged its continued support for rural electrification."

He pictured Nelsen as "a dedicated man," who "has been heart and soul in rural electrification since the program started."

In defending the Interior Department, Lovre pointed out that the nation's hydroelectric possibilities were not unlimited. What the department is doing essentially, he added, is "looking ahead to the time when these facilities are in full use" and "planning as to how our needs for new power are going to be met."

"After the smoke of battle has cleared," he added, "I'm sure that we'll find that most of the supposed wrongs were imaginary."

Sole Support . . . The Administration could find little to cheer about in what the rest of the chief speakers had to say.

Morse charged "the Eisenhower Administration has carried on a systematic scheme of turning over the magnificent natural and power resources of the people to the private utilities.

"To keep the record straight I suggest that the Department of Interior be renamed 'the Department of Private Utilities.' "

Maybank asserted the most serious threat to the rural electrification program in its history had emerged during 1953.

"This is the threat," he said, "to your bargaining power, the power supply of many of your members, and the future power supply of the entire nation.

"It is my sincere conviction that the partnership between the federal government and the local rural systems is being destroyed and a new partnership of dubious extraction is being substituted for it."

He referred to the Missouri Basin marketing criteria as "a giveaway of the people's energy resources and an abrogation of preference rights."

Preference Threatened . . . The preference clause came under the more

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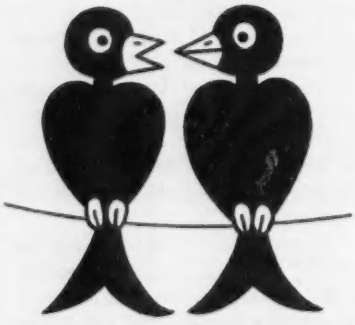

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severe examination of Ellis Arnall. He interpreted the clause to mean: "Do the people have the right to sell the power generated by the people's public facilities back to the people themselves for the convenience and the prosperity of the people?"

He added: "It is unthinkable that any responsible official of our country can supply other than the answer: 'Yes.'"

He dwelled on a Georgia Power Co proposal to market power from Clark Hill Dam to co-ops in that state, now before Interior Department.

"The outcome of the Clark Hill issue," he said, "will affect, either directly or indirectly, every citizen of our country. It can ultimately make or break the REA program itself."

For Federal Atom Program . . . Holifield defended the principle of government development of atomic power programs.

"The government itself," the Californian said, "by embarking on a diversified program of reactor construction for power purposes will hasten the day when atomic power is in the competitive cost range, when agencies big and small, public and private, can engage in atomic power production and distribution."

"Private industry spokesmen are very, very cautious," he added, "about incurring financial risks in atomic enterprise, but they fret and fume because the Congress is cautious about making changes in the basic legislation which brought about such marked achievements these past few years."

No Argument . . . In addition to the resolutions upholding their executive manager, delegates to the meeting passed 41 other resolutions, without dissent. The major ones adopted call for:

- The Secretary of the Interior to withdraw immediately the new power policy and the Missouri Basin power marketing criteria—"an extension of that policy."
- An amendment to the Internal Revenue laws to prohibit the deduction of advertising costs of private power companies "where such advertising is designed for purposes other than legitimate promotion of sales and services."
- Preference clause protection in any bill for development of power from Niagara and St. Lawrence Rivers.

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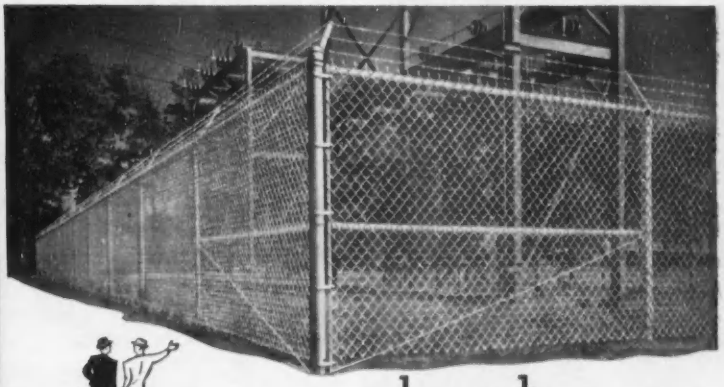

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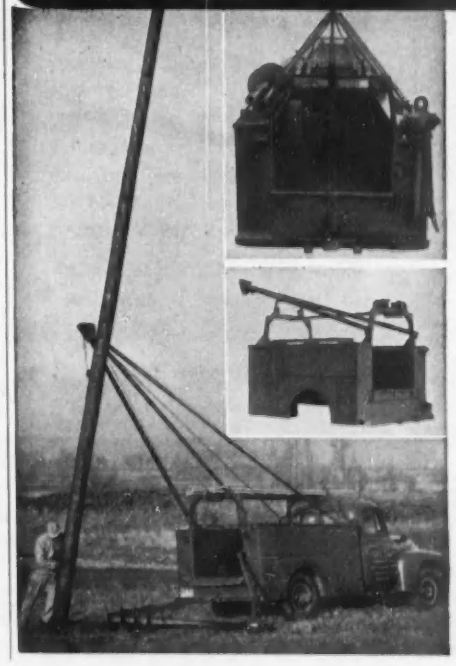

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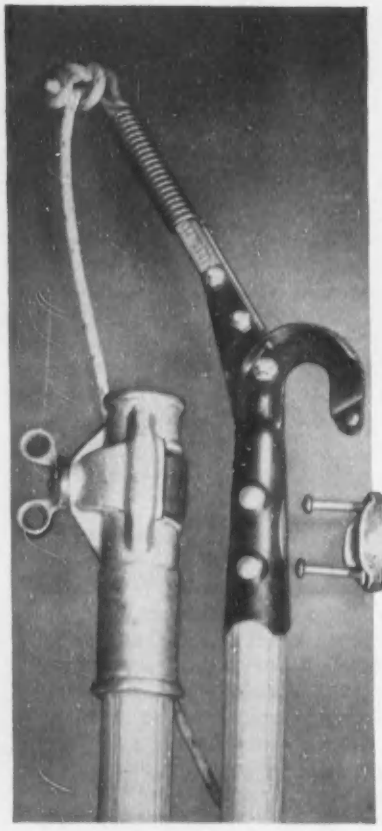

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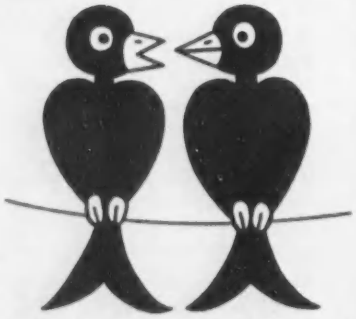

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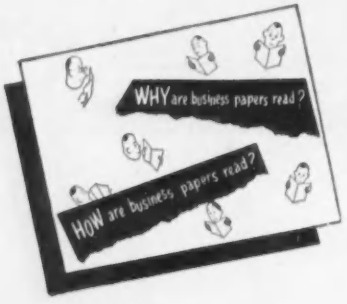

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• Appropriations for construction of "all multipurpose hydro projects approved by proper authorities," including Hells Canyon, Table Rock, Niagara, St. Lawrence, and the Colorado River Storage Project.

• Appropriation of adequate continuing and construction funds for SPA and Sepa "to enable them to honor existing contracts with preference agencies."

• Condemnation of any attempt to sell federal projects to commercial utilities.

• Appropriation of $150 million to REA, with an additional loanable contingency of $50 million, and $9 million for administration of the program.

• More representation of public and cooperative groups on the Hoover Commission and the Commission's Task Force on Water & Power.

NW Aluminum Official Defends Use of Power

Pacific Northwest must develop low cost power beyond its needs to attract new heavy industries, declares a veteran power observer. That was the answer given by William A. Dittmer, power manager for Kaiser Aluminum & Chemical Corp to those who say heavy industry deters the Northwest by gobbling up its power.

The Northwest's rapidly expanding economy needs the new sources of basic revenue heavy industries offer, Dittmer said in an address to the Spokane Kiwanis club. It was virtually his first public statement on hydroelectric power since resigning as Bonneville Power Administration power manager to join Kaiser in April 1953.

"The one important resource the Northwest can expand substantially," said Dittmer, "is its hydroelectric power. Hydro power can be used to attract additional heavy industries, but only those which use large amounts of power because the cost of power is an important part of the total cost of their product, he stated.

"To realize our opportunity for continued growth and employment, we must develop hydro power beyond our ordinary needs," he declared.

Dittmer argued that lighter industry would come naturally to the Northwest with increased population and growing markets. He said the number of new jobs needed to sup-

port greater population cannot be supplied by agriculture, lumbering, mining, tourist and similar industries.

"It is wishful thinking to believe that power alone can attract large number of high employment manufacturing industries using small amounts of power," Dittmer asserted.

"The same type of wishful thinking has deluded some persons who believe that high employment industries have been kept out of the Northwest by the aluminum industry. I have been closely associated with the power business in the Northwest since 1940 and I know of no case when that has occurred."

Merger of Pacific P&L, Mountain States Proposed

A proposed merger of Pacific Power & Light Co and Mountain States Power Co has been announced by Paul B. McKee, president of PP&L, and Z. E. Merrill, board chairman of Mountain States.

"Consolidation of the two operations would greatly strengthen the ability of the companies to meet present and future public service requirements of their customers and to support the development of the region," the joint announcement said.

Proposal calls for stock exchange on the basis of nine shares of Pacific stock for each ten shares of Mountain States common and one share of Pacific $100 par value preferred for each two shares of Mountain States $50 par value preferred. Stockholders will vote on the plan in special meetings set for March 12.

Annual operating revenues of the merged companies would total over $36 million, and total number of customers would be 263,000.

NPPA Cites McNary Cost 'Errors', Asks Rehearing

Errors in interim allocation of McNary Dam costs by the Federal Power Commission are alleged in a petition for intervention and application for rehearing on cost question field Jan. 9 by the Northwest Public Power Association. The allocation would subsidize navigation interests at the expense of electric consumers, NPPA has declared, putting "an unwarranted and unnecessary burden of costs upon the electric power rate payers of the Pacific Northwest."

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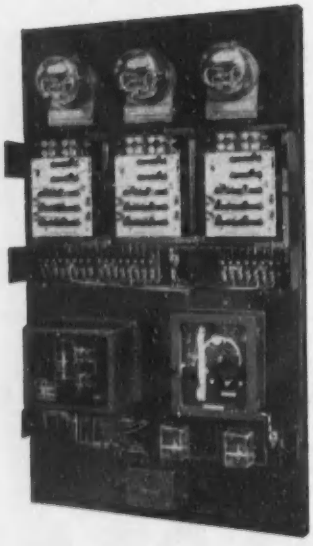

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FPC issued an interim allocation order Dec. 4 which NPPA asserts "is in contravention of statutes governing allocation and reimbursement of power costs. Petitioner maintains that the legislative history of the McNary project supports at the very least a 20% allocation of total construction costs to navigation, and if the Bonneville project allocation be a precedent, that's at the very maximum a 50% allocation of joint costs to power."

Among errors listed in petition and announced by Gus Norwood, NPPA's executive secretary, were: (1) Error in charging $283,201,600 of project costs to power development; (2) error in finding that 97.5% of construction cost ($133,943,000) of jointly used facilities should be allocated to power; (3) error in charging only 2.5% of joint-used facilities cost to navigation; (4) error in making no allocation of McNary costs to preservation of fish and wildlife, although authorized; and (5) error in formula used to determine allocations, and error in setting interest during construction at 2.5%.

TVA Files Its Answer in Suit Brought by Co-op

Tennessee Valley Authority recently filed answer to the federal court suit brought last Oct. 15 by the Volunteer Electric Cooperative of McMinn County, Tenn.

VEC, a wholesale customer of TVA, challenged the right of TVA to serve direct the new Bowaters Paper Co plant being constructed near Charleston, Tenn. VEC claimed that TVA planned to provide 17,000 kw of firm power and 10,000 kw of standby for the $51-million paper plant. BEC said that the paper plant was in its service territory and it should sell the power and not TVA.

TVA, in answering the VEC suit, claimed that VEC would not be able to serve the Bowaters plant if TVA withdrew its plan to supply the power. TVA also said that BEC wanted TVA to spent several million dollars to set up the Bowaters power supply without taking heavy risks involved.

The answer filed by TVA denied any breach of contract with VEC and claimed that the disagreement boils down "not as to who shall physically deliver the power, but whether the delivery shall be for the account of VEC or of TVA."

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P-1283, Electrical World
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3	75	West.	44000—7200/12470 Y
3	5000	G. E.	38100/66000—6600
4	4500	G. E.	36000—13300—2400
3	3333	G. E.	33000/11000—2400/7200
3	333	G. E.	33000—7200/12470 Y
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3	200	A. C.	34500—2400/7200/12470 Y
3	75	Wag.	33000—7200/12470 Y
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4	450	A. C.	25410/44000 Y—13280/23000
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1—1000		Moore	Condensing—Extraction—190 lbs., 2400-3-60—Surface Cond.
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1—3125		G.E.	25/60	4150/2400 x 2400/4150
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1—2000		G.E.	500	666 25 cy.	11000
2—1750		G.E.	514	250	2400
1—1500		C.W.	514	115	4000/13800
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1—750		Whse.	900	275	2300/4150
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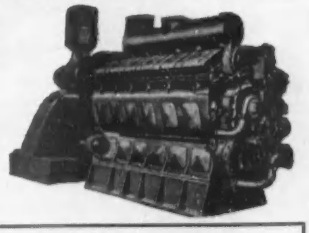

A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1980	Nordberg	TS-217	2800	225	320	Enterprise	DSG-6	560	450
1136	Fairbanks Morse	38D	1600	720	300	General Motors	8-268A	450	1000
1100	General Motors	16-278A	1600	720	200	General Motors	8-268A	350	900
750	General Motors	12-567	1080	720	150	Worthington	CC-4	225	450
500	Baldwin	VO-8	750	514	150	Ingersoll-Rand	8-4	225	600
500	General Motors	8-278A	750	720	150	Buckeye	80	240	600
500	General Motors	8-567	720	720	100	Worthington	BB-5	150	600
480	Worthington	DD-8	700	360	100	General Motors	3-268A	150	1200
400	Ingersoll-Rand	S-8	600	720	60	General Motors	6-71	90	1200
350	Baldwin	VO-6	510	450	30	Internat'l Harvester	UD-14	45	1200

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1—1500 KVA G.E., 3 Ph., 4150V. 2300V. Pyranol
2— 750 KVA G.E., 3 Ph., 4150V. 120/240V. sec.
2— 750 KVA G.E., 1 Ph., 4600V. 115/230
2— 400 KVA Pitts., 1 Ph., 2400/4800V. 240/48V.
3— 333 KVA Whse., 1 Ph., 2400V. 600 V. sec.
2— 300 KVA G.E., 1 Ph., 13200V. 220/440V.
1— 200 KVA G.E., 3 Ph., 2400-220 sec.
3— 200 KVA G.E., 1 Ph., 13200V. 440V.

SYNCHRONOUS MOTORS

1— 300 H.P., Elec. Mach., 720 RPM. 3 Phase 60 cyc., 2200V T E F Sealed Outdoor service.
1— 150 H.P., G.E., 1800 RPM. 220V. 3/60.
2— 150 H.P., Al. Chal. 360 RPM. 440V. 3/60.

MOTOR GENERATOR SETS

1—1000 KW Whse., 600 V. 720 RPM. 4000 Syn.
1—1000 KW G.E., 600 V. 514 RPM. 4000 Syn.
1—1000 KW Whse., 275 V. 720 RPM. 4000 Syn.
1— 200 KW Whse., 250V., 900 RPM. 4000V. Syn.
1— 150 KW G.E., 126/250V. 1200 RPM. 2300 Syn.
1— 100 KW G.E., 250V. 900 RPM. 2300V. Syn.

SLIP RING MOTORS

2— 500 H.P., G.E., M 1200 RPM 2400 V.
1— 400 H.P., West., CW. 450 RPM. 550V.
1— 250 H.P., West., CW. 600 RPM. 440V.
1— 200 H.P., West., CW. 600 RPM. 440V.
3— 150 H.P., Al. Ch. 1800 RPM. 2300V., 3PH. 60 Cy.

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MAKE	CAPACITY	SPEED	H.P.
2—Fairbanks Morse	1000 KW	720 RPM	1600
3—Cooper-Bessemer	475 KW	400 RPM	
		Diesel-Generators	6708
Turbine Generators			
1—Allis Chalmers	3000 KW	450#	psig
1—General Electric DE	2000 KW	1450#	psig

All of above machines are 2300 volt.
Drawings and Complete Data are on file.

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Cole Electric Co.

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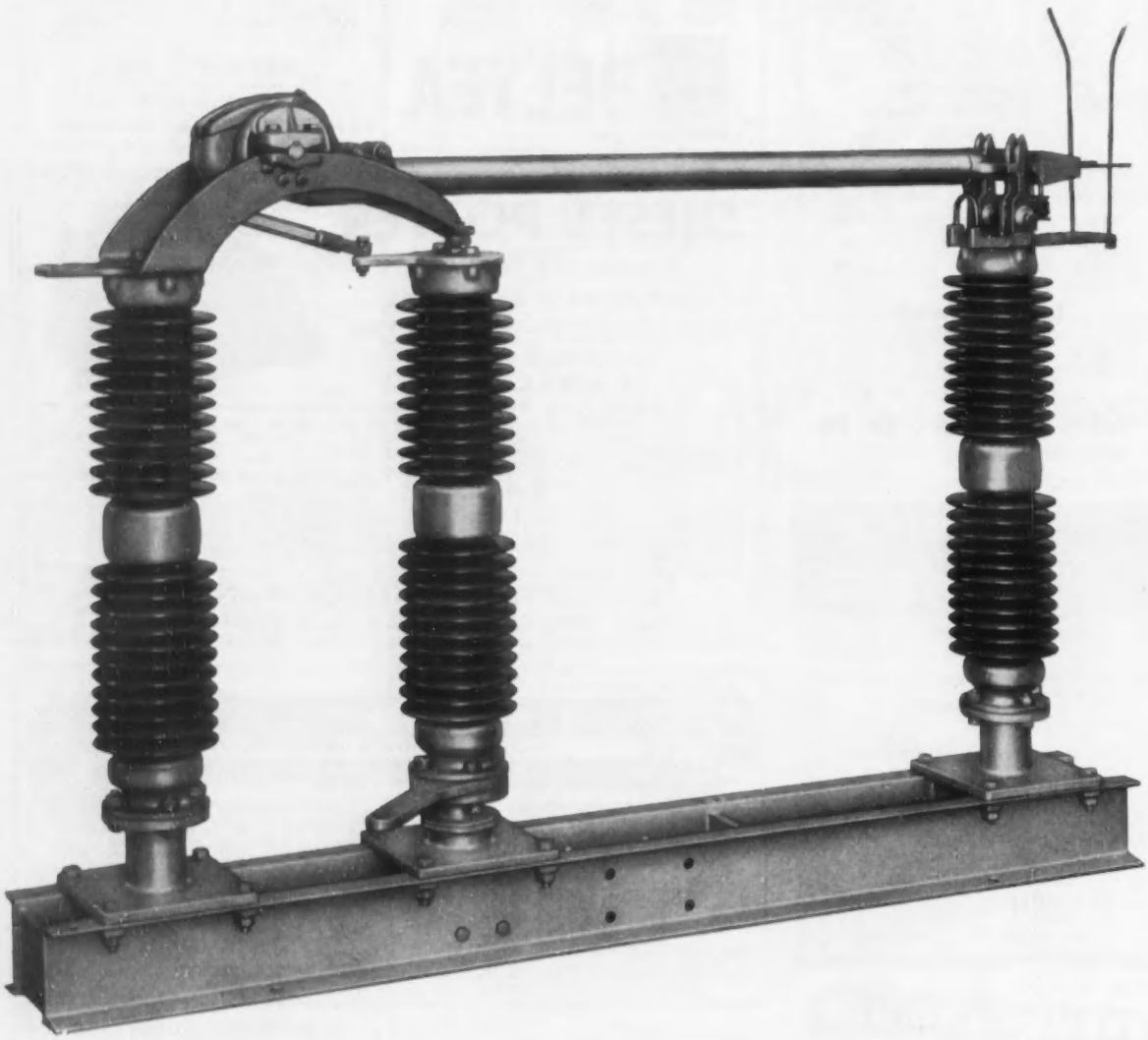

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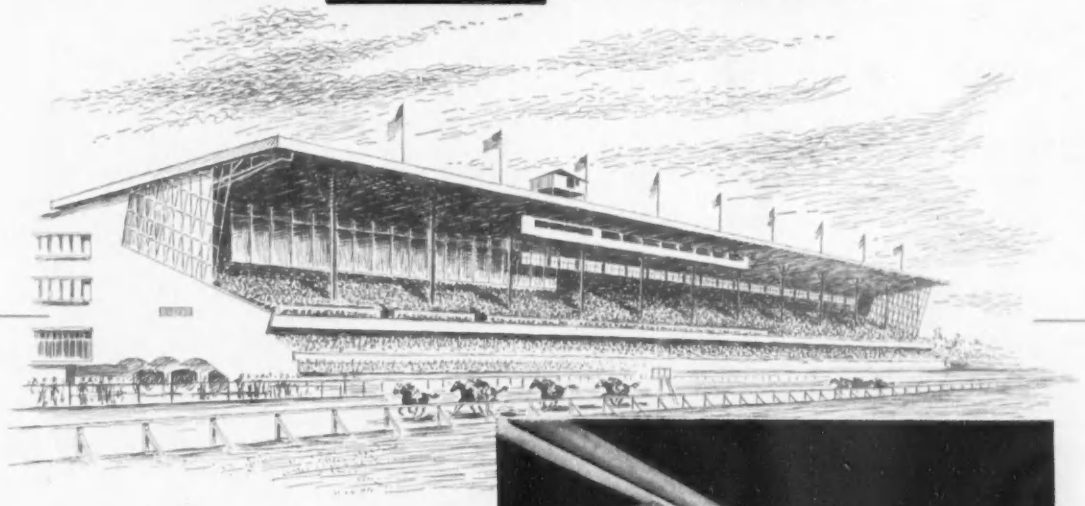
FEDERAL NOARK® POWER CENTER... THE WINNER AT LAUREL!



IT TAKES ELECTRICITY to operate a race track. Without electricity you'd have trouble buying an admission ticket or placing a bet . . . and how could the horses get through the gates or give you a photofinish? Well, Laurel, in Maryland, is today's most modern track, and its electrical system is controlled by Federal Noark main service equipment, lighting and power panels, motor controls, control centers and a unit substation.

Federal Noark equipment is today's best answer in buildings of every type and wherever else there's an electric light and power control problem. Most of this equipment is factory-assembled from standard units to meet individual specifications. All of it brings minimum installation costs . . . and is designed for maximum efficiency, easiest maintenance and remarkable flexibility for later changes or expansion.

Next time you have an electrical distribution problem, pass it on to Federal Noark for the most practical and economical solution.

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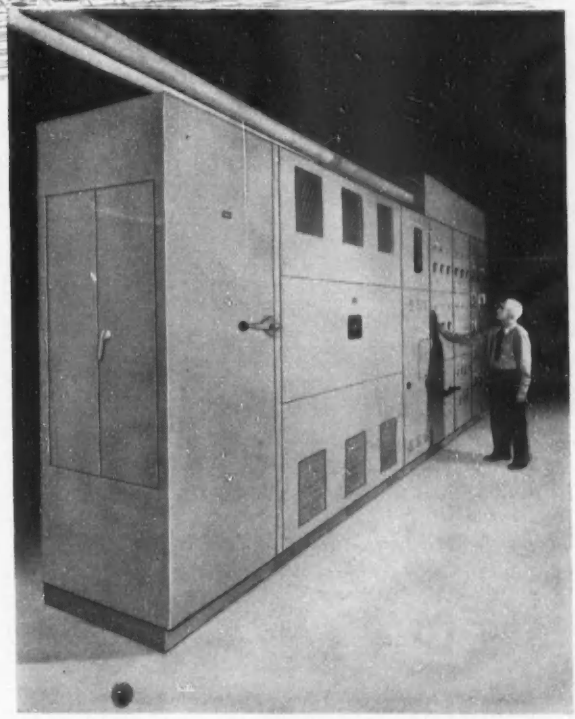

Federal Noark Power Center at Laurel Race Course. Factory-assembled and tested. Circuit breakers completely interlocked in all positions . . . high voltage switches coordinated with power fuses. Complete sectionalizing between high and low voltage and individual breakers makes maintenance safe and easy. On the complete Laurel electrical system, Architect was Arthur Froehlich, Beverly Hills, California; Contractor, Harry S. Mickey, Baltimore, Maryland.

Federal Noark products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct — **Pacific Electric Manufacturing Corporation products:** High voltage circuit breakers and power switches ★ Sales offices in principal cities.

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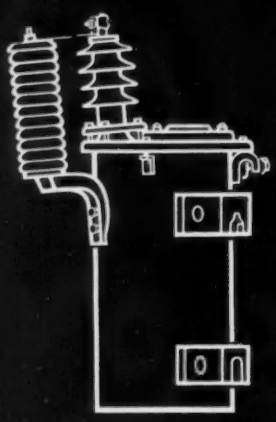

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